Pit and Quarry

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Pit and Quarry

Vol. XVIII CHICAGO, ILL., JULY 17, 1929 No. 8

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is taken from our files and its selection is without significance as to current events or as to the position of the individual in the industry.

H. W. Caldwell

President, Cleveland Quarries Company

Cleveland, Ohio

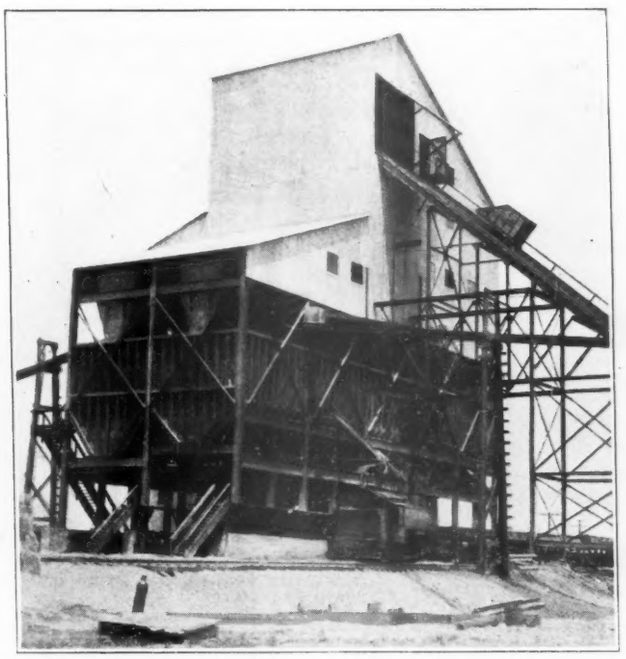
American Aggregates Corporation Operates New Modern Sand and Gravel Plants At Indianapolis and Cincinnati

Two Plants of Similar Design Use Different Methods of Excavating Material from Deposits

By W. E. TRAUFFER

THE American Aggregates Corporation, already one of the largest producers of sand and gravel in the United States, recently put into operation two new gravel washing, screening and crushing plants, both of which are of the most modern design and use the most efficient types of equipment. The newest of the two plants is in Indianapolis, Indiana, and the other in Miamiville, a suburb of Cincinnati, Ohio.

Both plants are of the same general type of design and construction, with the exception that at Indianapolis the gravel is excavated by a dredge, while at Miamiville steam shovels and cars are used. Both plants haul material to the screening building by means of balanced type skip-hoists. Concrete and steel are used almost exclusively in the construction of both plants, with the exception that the Indianapolis plant has bins of creosoted timber with structural steel frame, while the Miamiville plant has concrete bins. Both have facilities for shipping by either truck or rail.

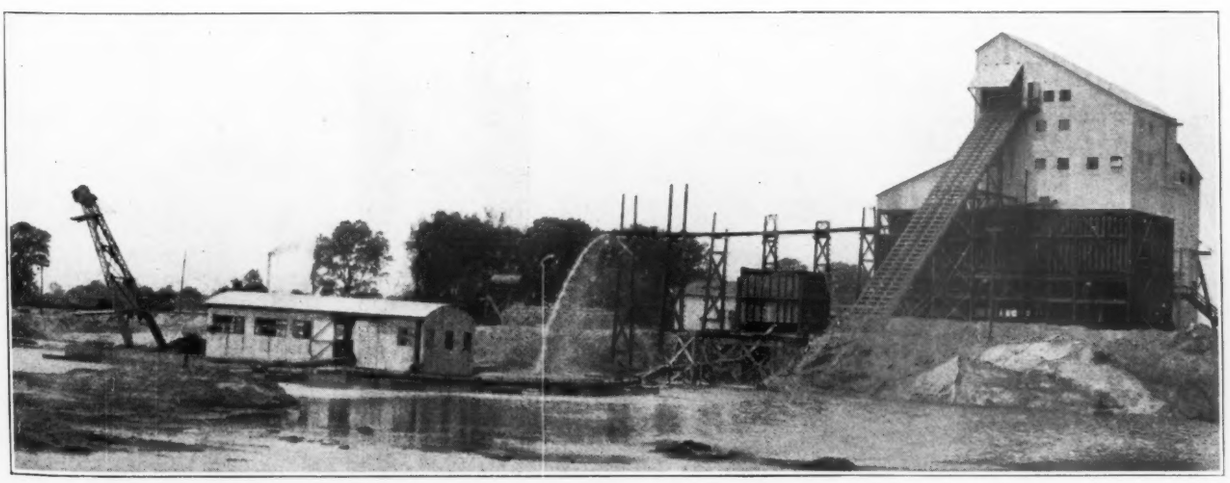


Plant from Southeast with Car Going Up Incline

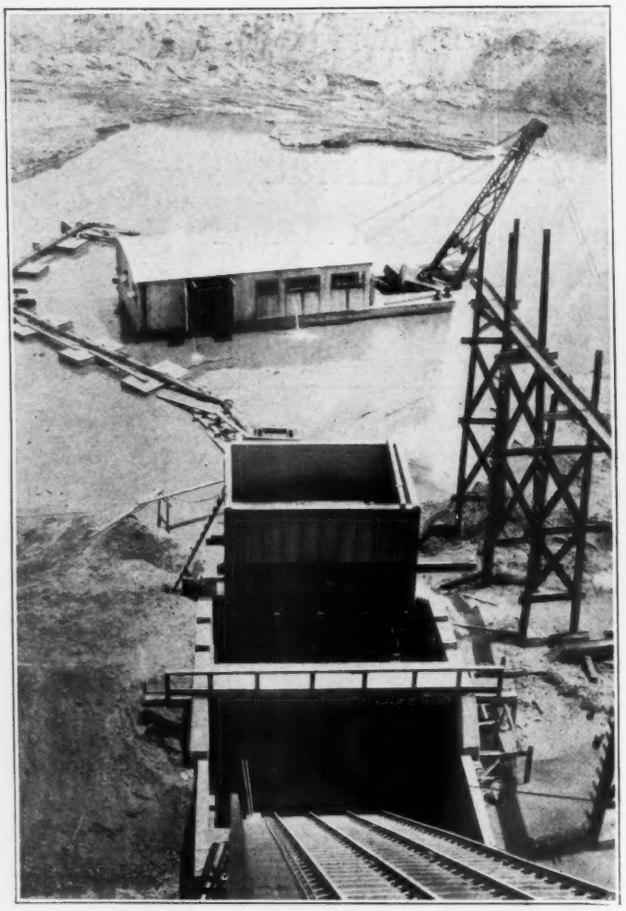
The Indianapolis Plant

The new Indianapolis plant of the American Aggregates Corporation is located on Raymond Street west of the White River, about 2 miles southwest of the heart of the city. The property of 400 acres is all flat ground with 4 ft. of overburden covering a gravel deposit averaging 55 ft. in depth.

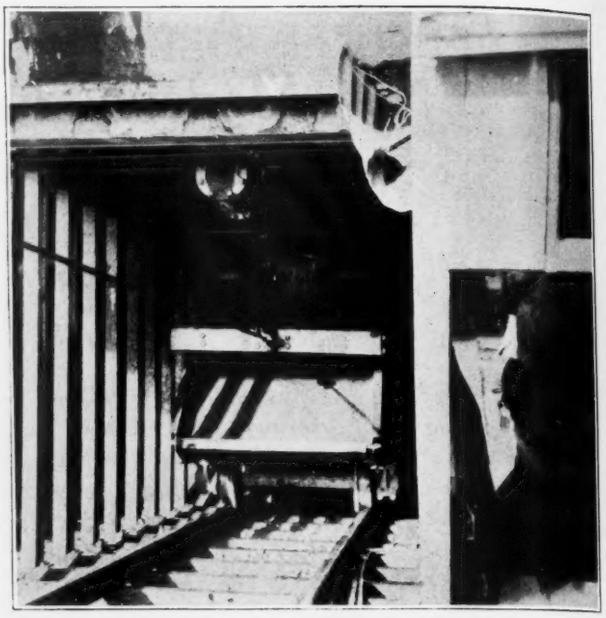
The plant has concrete foundations and a structural steel framework covered with corrugated metal. Its capacity is 5,000 tons per day with the present equipment and the design is such that additional equipment can be installed to increase this capacity whenever desired. It was designed by the engineering department of the American Aggregates Corporation and built with its own construction forces. Construction was begun on Oc-



Indianapolis Plant from East With Dredge at Left



Looking Down on Dredge and Skip Feed Hopper from Top of Main Building



Skip Car Being Loaded in Pit Through Air Controlled Gates

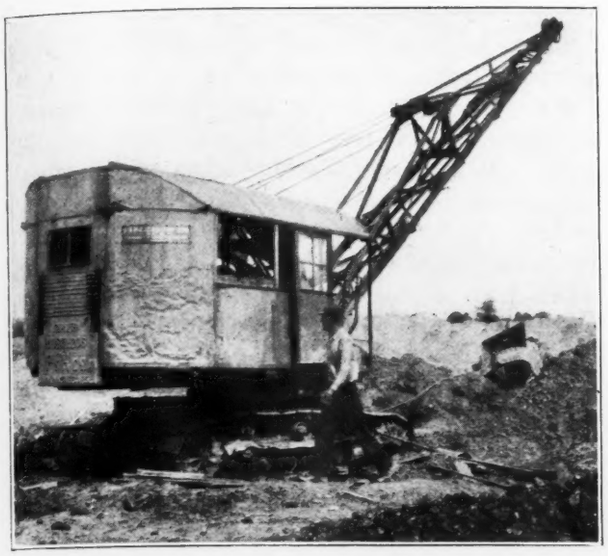
tober 8, 1928, and completed April 1, 1929. Practically all of the machinery and equipment used in the plant was manufactured in the company's own shops, including the screens, elevators, conveyors, sand boxes, skip hoist, skip cars, dredge hoist, dredge boat, driving machinery, etc.

An unusual feature in connection with the plant is a four-track railroad bridge over West Raymond Street, one of the busy thoroughfares of Indianapolis, which connects the plant to the Indianapolis Union Railway. More than 300,000 yards of filling were provided for the plant railroad track grades.

Stripping and Dredging

Stripping is being done by a Bucyrus Class 24 steam dragline excavator mounted on rails. The 4-cu. yd. capacity drag bucket was made in the company's own shop,, The Greenville Manufactur-

Indianapolis Plant from Northwest. Office at Left, Machine Shop and Testing Laboratory at Right



Small Dragline Making Fill for Tracks

ing Works, and has a slotted back-plate to allow water to drain out. The overburden is being put into levee improvement and other work being done by the company.

The dredge hull is of steel plate and is 84 ft. long and 26 ft. wide with a well 12 ft. wide and 28 ft. long for the ladder. The superstructure is of structural steel with corrugated metal siding and roofing. The nozzle ladder is 65 ft. long and is supported from a 52-ft. A-frame.

The cutter head is of the rotary type and is driven from the upper end of the ladder by a 30-hp. electric motor through four sets of reduction gears.

Dragline Stripping Overburden. Note Slotted Backplate on Drag Bucket

A Greenville 5-drum hoist driven by a 30-hp. motor operates the two swing lines, the two shore lines and the ladder. No spuds are used on this dredge. The dredge pump is an Amsco 15-in. Type H-Form 44 centrifugal pump with right-

Another View of Indianapolis Plant with Dredge in Foreground

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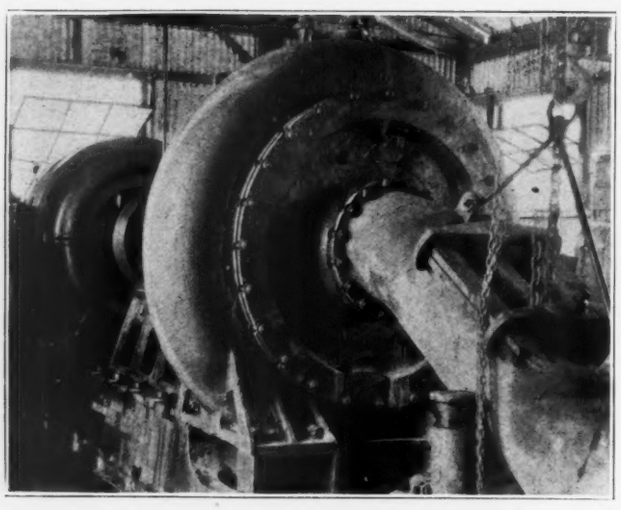
Operator at Dredge Controls

hand drive and bottom discharge. It is driven by a 400-hp. variable speed electric motor using 4,100-volt current. The bearing between the motor and the pump is the customary Amsco water-cooled type. Water for priming, sealing and cooling is furnished by a 4-in. centrifugal pump driven by a 30-hp. motor.

The discharge is out the side of the dredge. A 16-in. pipe line is used with rubber dredging sleeves connecting pipe sections. The pipe line is supported on Greenville standard steel pontoons and has a tension cable. This cable, as well as all other cables used in the dredges, is Leschen flat-strand. An insulated cable carries power to the dredge. A 3-ton chain hoist supported from the roof of the dredge handles any repair parts for the pump and pipe line. Two hand-operated capstans at the front of the dredge can be used for lines in addition to those operated by the hoist. Two men operate the dredge. The operator controls all machinery from his station by means of a bank of levers for the hoist and electrical controllers to the pump, cutter and hoist motors.



Pump and Motor on Dredge at Indianapolis

The Field Hopper and Skip Hoist

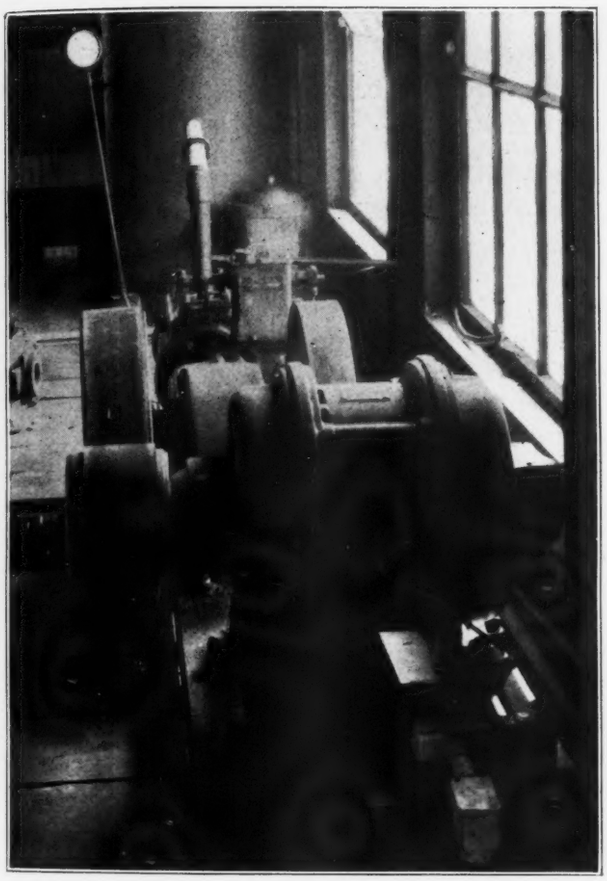
The pipe line discharges into a steel feed hopper on shore which is supported on the concrete bin and pit feeding the skip hoist. This hopper is only being used temporarily in its present location and is part of a dredge discharge box which will be used when the pond is enlarged sufficiently. The dredge will then discharge into the box from which the material will be hauled to the skip hopper in cars. The dredge discharge box is equipped with slide screens over which the material must pass. The top plate has 1-in. round and the second $\frac{3}{8}$-in. round perforations. The third plate is blank and has 9 lever-operated gates which can be

One of the Gyratory Crushers. Elevator to Stone Screen in Background

opened to divert any excess sand back to the pond. The concrete foundation is so designed that tracks can be laid over and alongside it for discharge from both bottom and side dump cars.

The concrete hopper discharges through two sliding gates into cars on the double skip track. These gates are operated by Curtis air hoists, controlled by an operator in the pit. A 4-in. centrifugal pump driven by a 10-hp. motor keeps the pit dry. Air for the hoists here and those in the plant is furnished by a 4-in. by 5-in. horizontal air compressor driven by a 10-hp. motor. This compressor is located on the screening floor of the plant.

The skip is of the balanced type with two 5-yd. cars. The cars are operated by a Greenville single drum hoist driven by a 150-hp. motor, on the ground floor of the plant, which is controlled by an operator at the top of the incline. The hoist is equipped with a solenoid brake, which takes hold the instant the power shuts off. The emergency brake is controlled by the operator and a Greenville electric stop switch automatically prevents the cars from over-running at either the top or bottom of the incline. The incline, which is 175 ft. long with a slope of about 40 degrees, is of structural steel construction and has five bents on concrete foundations.



Compressor for Air Controlled Gates

Screening and Crushing

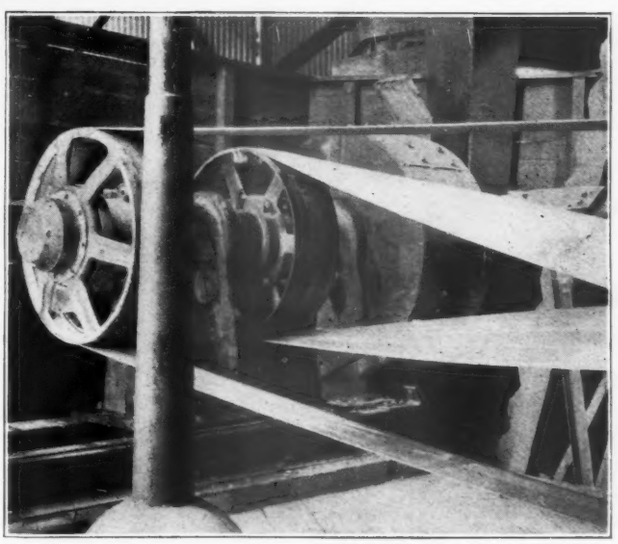
The skip cars discharge into a 50-ton capacity steel hopper. This feeds through two sliding gates into the two revolving gravel screens. Each of these gates is operated by a Curtis air hoist controlled by the skip hoist operator. The two gravel screens are identical in every way. Each has a 4-ft. by 25-ft. main jacket with 1½-in. round perforations, an inner jacket 5 ft. 6 in. in diameter by 13 ft. 6 in. long with ¾-in. perforations and an outer jacket 6 ft. 6 in. in diameter by 12 ft. 6 in. with ¼-in. by ¾-in. slots. A 5-ft. overhang on the main barrel has 1¾-in. perforations. Each of these screens is driven through a Texrope and double gear reduction drive by a 25-hp. motor.

Skip Hoist at Indianapolis Plant

Rollers on the outer jackets keep the screens free from blinds.

The ¾-in. to 1½-in. and ¼-in. to ¾-in. sizes can be chuted direct to any of the bins except the sand bins. The ¼-in. to ¾-in. material can also be diverted into two double deck vibrating screens for further separation. One of these is a Hummer Type V 2-ft. 6-in. by 5-ft. screen and the other a Simplicity 3-ft. by 6-ft. screen, which is belt driven by a 5-hp. motor. Current for the Hummer screen is furnished by a small generating set driven by a 2-hp. motor.

The material over 1¾-in. goes through a chute to any of three crushers on the ground floor of the building. These are all on concrete foundations. One is a Symons 36-in. disc crusher driven by a 50-hp. motor. The others are respectively Allis-Chalmers No. 4 Gates and No. 5 McCully gyratory crushers, each driven through Texrope drive by an individual 50-hp. motor. Two 5-ton traveling chain hoists over these crushers handle any repair parts. These crushers discharge into a Greenville bucket



Disc Crusher with Elevator to Stone Screen at Right

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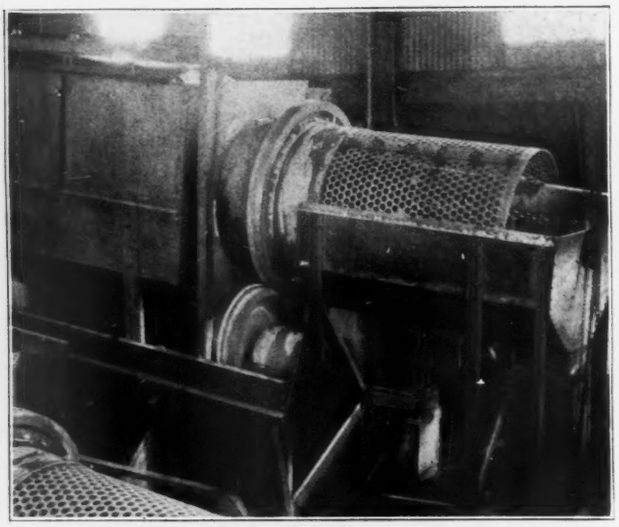
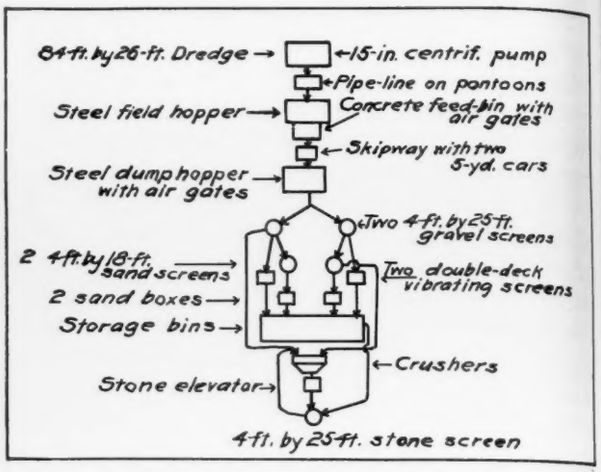


Stone Screen with One of Gravel Screens at Left

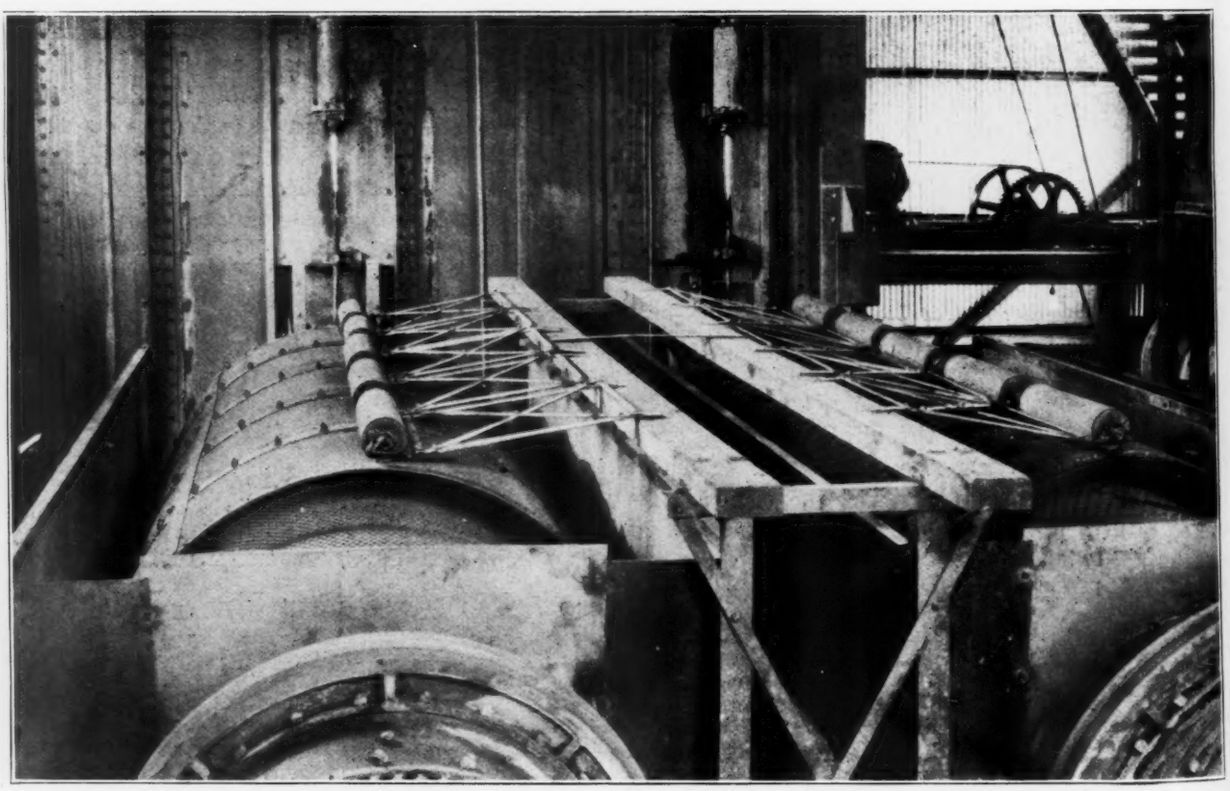


Flow Sheet of Indianapolis Plant

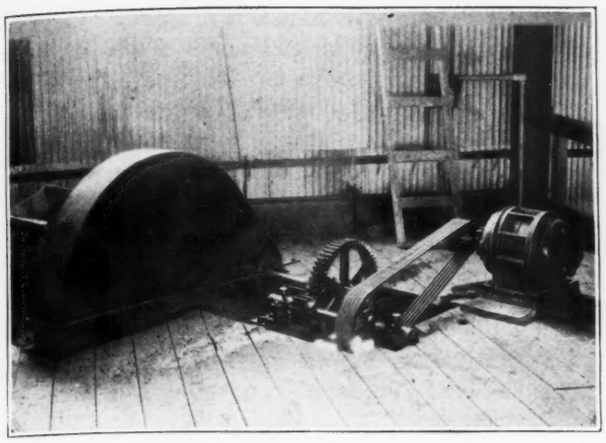
elevator with 18-in. buckets at 66-ft. centers feeding to a revolving stone screen. The elevator is driven through a Texrope and double gear reduction drive by a 25-hp. motor. The stone screen is identical with the gravel screens except that it has 1¼-in. perforations in the barrel and ¼-in. round perforations on the outer jacket. It is driven in the same manner by a 20-hp. motor and discharges into the same bins as the gravel screens. This screen also has rollers to prevent blinding of the outer jacket.

The material under ¼-in. from the gravel screens goes to two double-jacketed sand screens. Each screen has a 4-ft. by 18-ft. barrel with 3/16-in. mesh wire cloth, an inner jacket 5 ft. by 12 ft. with ⅜-in. perforations and a 5-ft. 10-in. by 11-ft. 8-in. outer jacket with 1/12-in. mesh wire cloth. Each of these screens has the same type of drive as the other screens and is driven by a 15-hp. motor. Brushes are used to prevent blinding on these screens. Trunnions, bearings, drives and other parts on the five screens are interchangeable, including even the inner barrels of the gravel screens, which are put into the sand screens for further wear after they are no longer fit for their original service.

The sand goes from the sand screens to two standard Greenville sand boxes, where the coarse and fine sands are finally separated. An operator on a platform between the sand boxes keeps them



The Two Gravel Screens at Indianapolis. Steel Bin in Background with Air Operated Gates



Stone Elevator and Drive

Closeup of Perforated Plates on Feed Hopper Discharging Gravel Into Skip Feed Bin

at the proper level by discharging through 8-in. nipples into the sand bins. Waste water is flumed to either of the two ponds as desired.

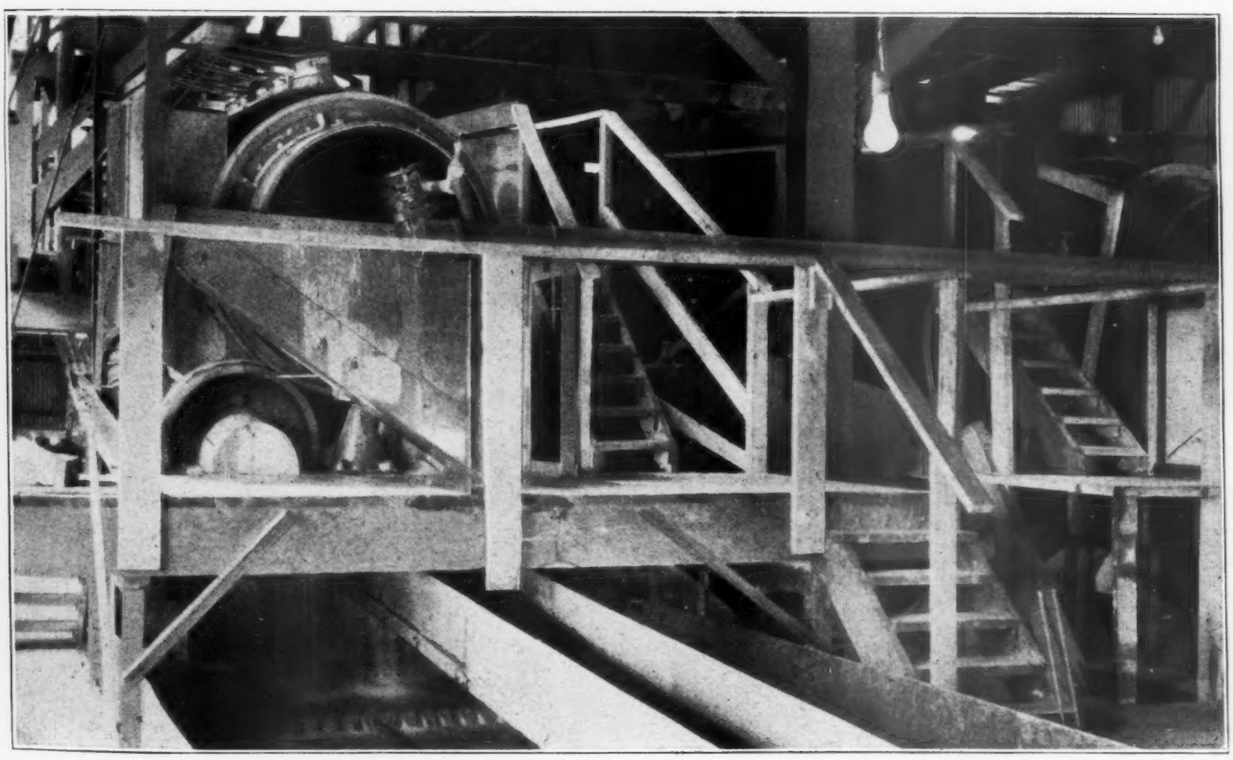
The bins which support the screening plant are in two rows of 5 each with a total capacity of about 1,500 cu. yd. They are made of creosoted timbers reinforced with structural steel. One row of bins is for truck loading and the other for car loading. The two south bins in each row contain sand. The car loading bins also have side discharge gates so that cars on a siding alongside the plant can be loaded in an emergency. The truck bins have pans to carry away all drippings from the bins.

Washing Water

Washing water for the plant is provided by two Allis-Chalmers 8-in. Type SF centrifugal pumps, each of which is driven by a 100-hp. Allis-Chalmers motor. The discharges from the pumps converge into a common 15-in. pipe-line, which carries the water to the plant building. The pump house is of wood-frame construction with corrugated siding and roofing and is supported on three large cylindrical pontoons to provide for the rise and fall of the river water.

Power and Miscellaneous

Electric power comes from the public service wires at 33,000 volts. An outdoor substation on the property, maintained by the power company, reduces the current to 4,100 volts. This current is used for the dredge pump and skip-hoist motors. An outdoor transformer further reduces the current to 440 volts for general plant use.



Sand Screens and Settling Tanks at Indianapolis

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Locomotive Switching Cars at Indianapolis Plant

A machine shop near the plant contains an emery wheel, drill-press, forge, racks for small parts and other miscellaneous equipment. A small building nearby is used as a laboratory for the highway department's inspectors. This contains two American Gas Machine Company stoves for drying the aggregate and a W. S. Tyler sieve shaker as well as equipment for making colorimetric and elutriation tests. A neat wood-frame building contains the plant offices and an automatic truck scale.

The Miamiville Plant

The new Miamiville plant of the American Aggregates Corporation went into operation in December, 1928. Construction was started in January of the same year. It is located at Miamiville, Ohio, about 16 miles northeast of Cincinnati on the Little Miami River. The property consists of about 85 acres, of which 75 acres can be excavated with either steam shovel or dragline. The deposit is about 60 ft. deep, 18 ft. of this being below water level. About 50 per cent of the gravel is over 2½-in. in size and must be crushed.

Pit Operations

The overburden averages about 3 ft. and is removed by an Erie 1¼-yd. caterpillar steam shovel. It is hauled away to a dump in 6-yd. side-dump cars by a 25-ton steam locomotive. When the pit is sufficiently enlarged and the stripping far enough advanced, all of this equipment will be used in the pit.

A Marion 37 revolving steam shovel with a 1¼-yd. dipper and caterpillar treads is used in the pit, which at present is about 35 ft. deep. The shovel loads into a train of two 6-yd. side-dump cars, which are hauled to the plant by a Davenport 25-ton saddle-tank locomotive. When the equipment now used for stripping overburden is moved into the pit, two trains will be operated, giving a continuous flow of material to the plant.

Plant Operations

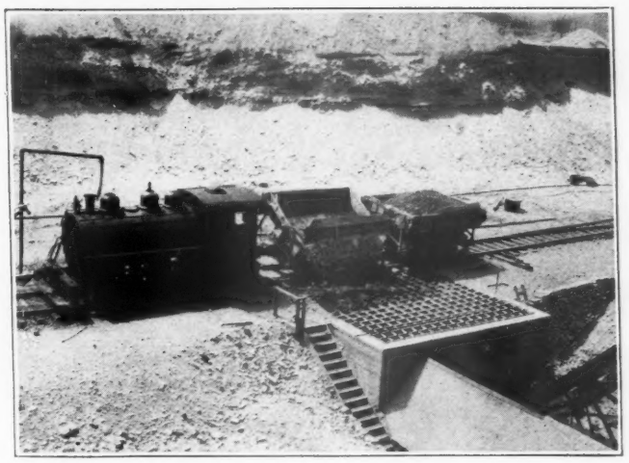
The cars are dumped into a 60-cu. yd. capacity concrete hopper having a rail grizzly with 11-in. by 11-in. openings to reject all stone too large to be crushed. Material is fed through two undercut gates, each of which is operated by a Curtis air hoist, into cars on a balanced type skip. The cars, which have a capacity of 5 tons each, are operated by a fixed single drum electric hoist driven by a 175-hp. electric motor. The hoist control is the

Cars and Trucks Loading Under Bins at Indianapolis

General Electric full automatic type and the cars are protected against over-travel by a screw-type limit switch. A hoist controller is so arranged that it will open the control circuit and set the hoist brake should the power supply fail or something go wrong with the operating mechanism. In addition to this mechanical controller there is a 30-in. solenoid brake mounted on the motor armature shaft. While the current is on, the magnet of this brake is energized, holding it out of contact with the brake drum. Should the power fail, this brake would instantly be applied, holding the load safely.

The hoist is self-accelerating and self-retarding and has a cycle of operation which allows 5 sec. to gain its full speed of 480 ft. per min. Full speed is held for 25 sec., and 5 sec. are allowed for deceleration. The hoist is then at rest for 15 sec. while the top car is dumping and the bottom car loading, after which the cycle is resumed. With these figures as a basis the haulage capacity of the skip hoist would be 500 tons per hour. On account of the human element in its operation, however, this system is rated at 400 tons per hour. The remainder of the plant is designed to handle that amount easily, the plant capacity being limited at present only by the rate at which the material is being excavated in the pit. Extension levers in the operator's house above the hoist permit remote control. The double-tracked skipway, which is of structural steel construction, and is 227 ft. long with a slope of 45 deg., was furnished by the Webster Manufacturing Company.

The cars dump into a steel hopper of 60-cu. yd. capacity at the top of the plant. Material is fed from this hopper to the primary screen through a chute which has a gate operated by a Curtis air hoist to control the flow. A jet of water in the chute insures free flowing of the material.



Cars of Gravel Being Discharged Into Skip Feed Hopper

The primary screen is 16 ft. long by 5 ft. in diameter and has 4-in. round perforations. A spray of water inside the screen thoroughly washes all of the material. The oversize goes through a chute into storage bins over the crushers. The material passing through the primary screen goes to a double-jacketed gravel screen 5 ft. in diameter with 12 ft. of 1¾-in. perforations and 3½ ft. of overhang with 3-in. perforations. The first jacket is 11 ft. long and 7 ft. in diameter with ⅝-in. perforations. The second jacket is 9 ft. long and 9 ft. in diameter and has ¼-in. perforations. The following sizes of material are produced: ¼-in. down, ¼-in. to ⅝-in., ⅝-in. to 1¾-in., and the oversize 1¾-in. to 4-in., which goes to another crusher feed bin. The various sizes can be combined by turning a flap gate in the hopper. The

Shovel Loading Into Cars in Miamiville Pit

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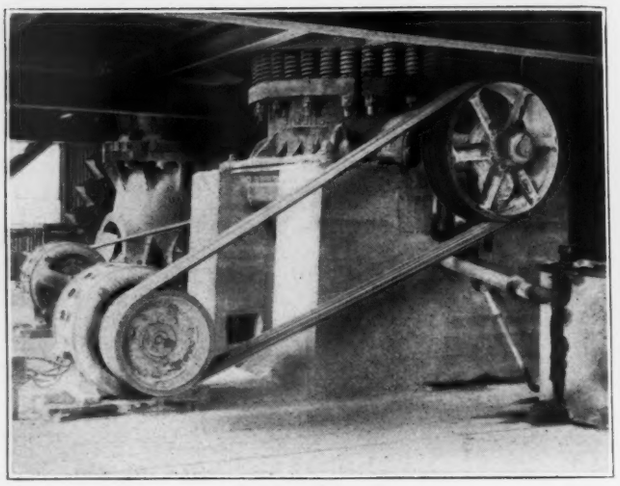
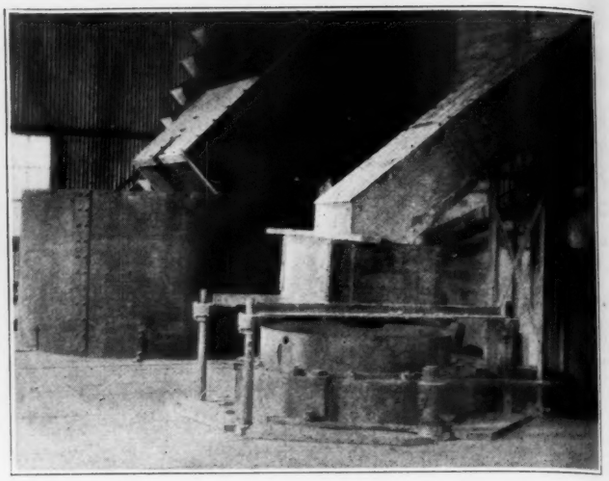


The Two Crushers in the Miamiville Plant. Stone Elevator in Left Background



Feed to Crushers. Stone Elevator in Background

material passing the 3-in. screen can be added to the 1¾-in. down or mixed with the oversize as desired.

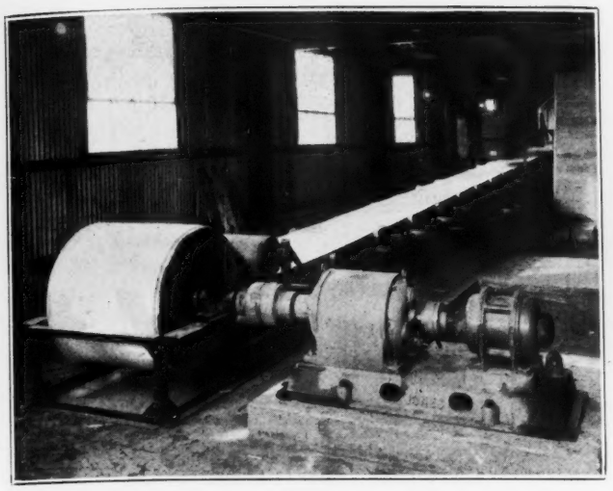
The material from ¼-in. down goes to a chute with a perforated plate in the bottom, the material passing these plates being fine sand and that retained being coarse sand. Each of these sizes goes to a Webster sand drag tank, where the sand is drained by inclined flight conveyors and chuted direct to storage bins. The sand boxes are driven by 5-hp. motors through speed reducers. The revolving screens are also of Webster make.

Crushing Operations

Each of the two crusher storage bins now in use has vertical sliding gates controlled by Curtis air hoists. The material from 4-in. up, which is in the northernmost bin, feeds to a 16-in. Allis-Chalmers Superior McCully gyratory crusher, which reduces to 3-in. and under. The 1¾-in. to 4-in. material feeds to a 48-in. Symons cone crusher, which crushes to 2 in. and under. Each of these crushers is driven by a 75-hp. motor through a Texrope drive. These crushers rest on concrete bases protruding through the second floor of the crusher building.

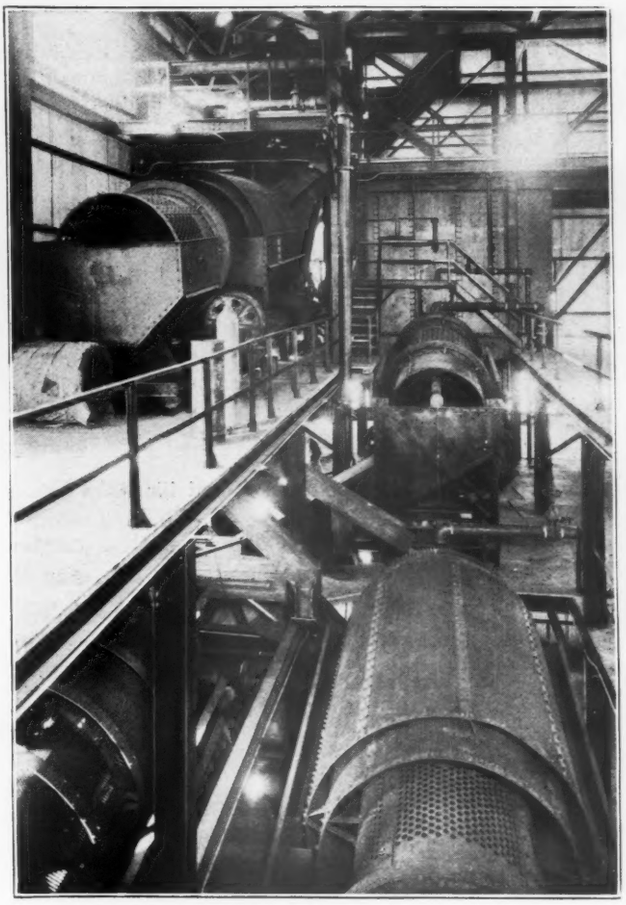
The crushers discharge onto a 36-in. Webster belt conveyor on 65-ft. 6-in. centers, which carries the crushed stone to a bucket elevator. The conveyor is driven by a 5-hp. motor through a speed reducer. An unusual feature is that the drive is at the tail end of the conveyor, which is furthest from the dust raised by the two crusher feeds. A vertical roller at the drive pulley provides the necessary contact with the belt.

Miamiville Plant from South. Outdoor Substation and Office at Left



Conveyor from Crushers to Stone Elevator

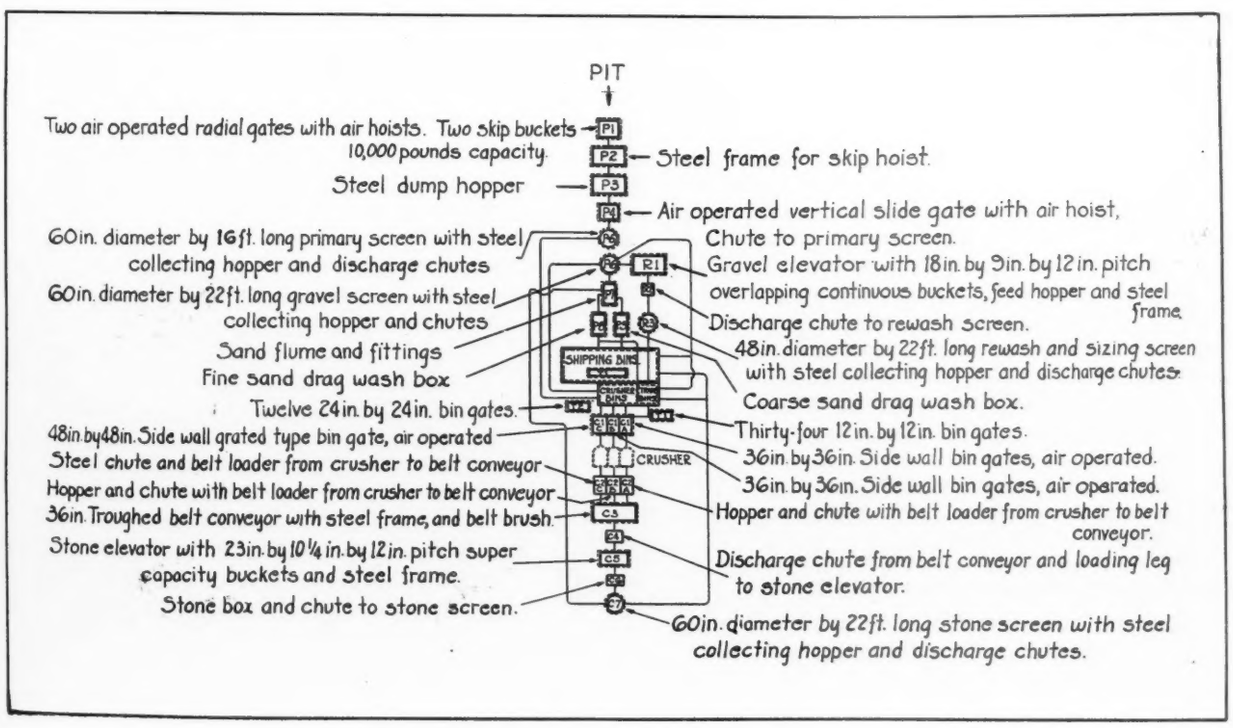
The main bucket elevator of Greenville make is a double unit, the first discharging into the second, and the second to the screens. These have 69-ft. and 43-ft. 6-in. centers respectively. Each unit is driven through a Texrope and double-gear reduction drive. The second elevator discharges into the 60-in. by 22-ft. stone screen, which has 12 ft. of 1½-in. perforations and 3½ ft. of overhang with 2½-in. perforations. It is double-jacketed, the first jacket being 11 ft. long by 7 ft. in diameter with ⅞-in. perforations and the outer jacket 9 ft. long by 8 ft. in diameter with ⅜-in. perforations. The sizes made are 2-in., 1-in., ¾-in. and screenings or dust. These all go direct to storage bins. The rejections go by chute back to the 1¼-in. to 4-in. bin for re-crushing. A switchboard on the screening floor controls all plant operations.



Screening Floor at Miamiville Plant

Plant Construction

The main plant building is divided into four parts. The concrete storage bins consist of two rows of 7 bins, with a track running under each


PIT
Two air operated radial gates with air hoists. Two skip buckets 10,000 pounds capacity.
Steel frame for skip hoist.
Steel dump hopper
Air operated vertical slide gate with air hoist.
60in. diameter by 16ft. long primary screen with steel collecting hopper and discharge chutes
Chute to primary screen.
Gravel elevator with 18in. by 9in. by 12in. pitch overlapping continuous buckets, feed hopper and steel frame.
60in. diameter by 22ft. long gravel screen with steel collecting hopper and chutes
Discharge chute to rewash screen.
Sand flume and fittings
48in. diameter by 22ft. long rewash and sizing screen with steel collecting hopper and discharge chutes.
Fine sand drag wash box
Coarse sand drag wash box.
Twelve 24in. by 24in. bin gates.
Thirty-four 12in. by 12in. bin gates.
48in. by 48in. Side wall grated type bin gate, air operated
36in. by 36in. Side wall bin gates, air operated.
Steel chute and belt loader from crusher to belt conveyor
Hopper and chute with belt loader from crusher to belt conveyor
36in. by 36in. Side wall bin gates, air operated.
Hopper and chute with belt loader from crusher to belt conveyor.
36in. Troughed belt conveyor with steel frame, and belt brush.
Stone elevator with 23in. by 10¼ in. by 12in. pitch super capacity buckets and steel frame.
Discharge chute from belt conveyor and loading leg to stone elevator.
Stone box and chute to stone screen.
60in. diameter by 22ft. long stone screen with steel collecting hopper and discharge chutes.
SHIPPING BINS
CRUSHER

Flow Sheet of Miamiville Plant

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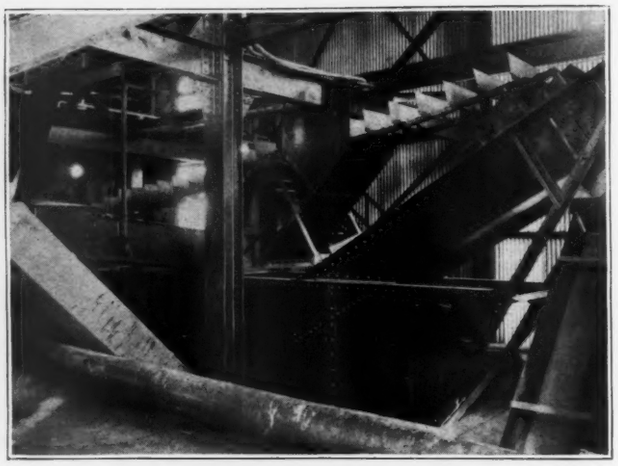


One of Sand Drag Boxes at Miamiville Plant

row for loading into railroad cars. Steel chutes from the screens are so arranged that any size of material can be loaded into any bin except the first two in each row to the south, which are used for sand. Each bin has a capacity of about 150 cubic yards.

The bins serve as a foundation for the main screen house and the tower, which have a structural steel framework and siding and roofing of corrugated galvanized iron. The tower houses the discharge end of the skip hoist and of the main stone elevator from the crushers. The crusher house is a 3-story building of steel-frame and corrugated-siding construction immediately adjoining the bins to the west. The plant was designed so that additional screens, crushers and other machinery could be installed at any time to increase the capacity of the plant without interference to operations.

Shipping Facilities

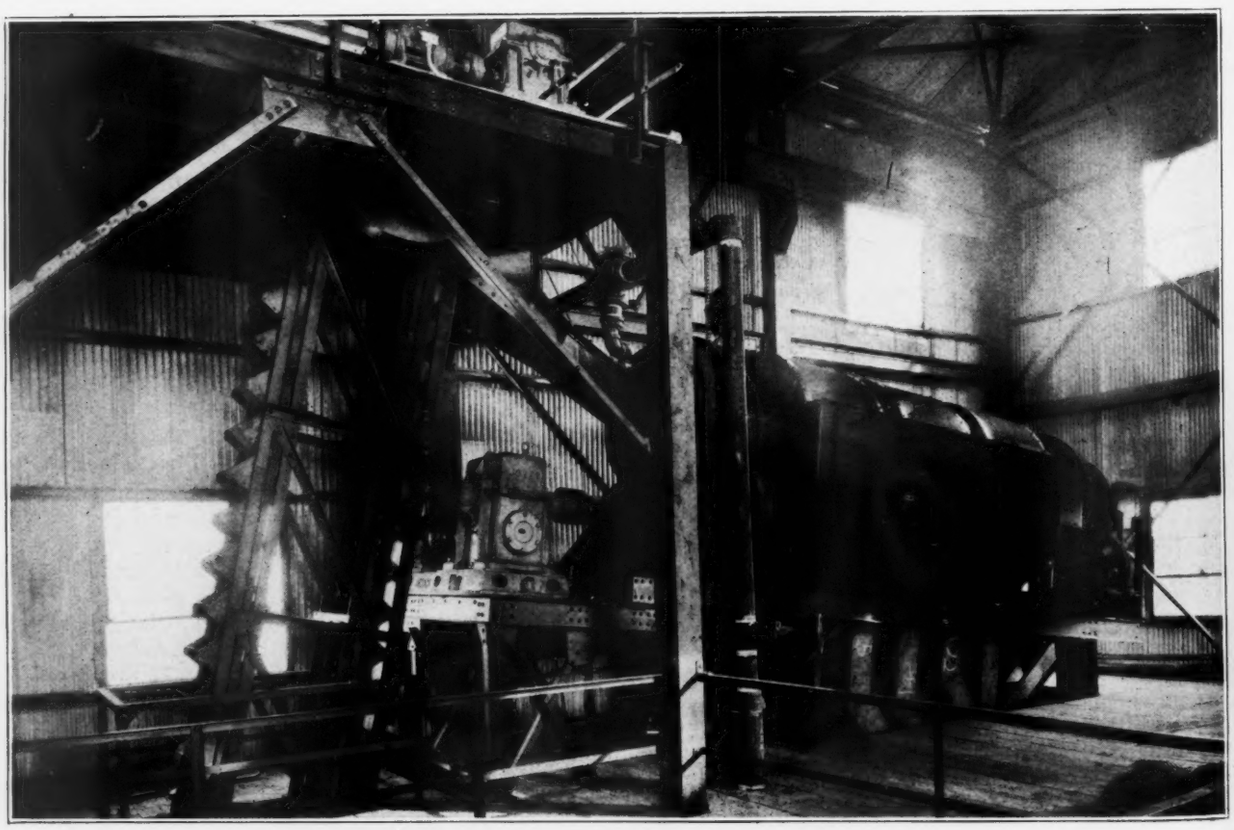
Most of the output of the plant is shipped to Cincinnati and vicinity, the sand and gravel to retail yards for general construction purposes and the crushed stone for road work. Most of the road stone is shipped by truck and the sand and gravel by rail. A gravity feed car storage track, with a capacity of 45 cars, serves both tracks under the bins. Rail shipments are made over the Cincinnati to Springfield branch of the Pennsylvania Railroad, which runs by the plant.

Machine Shop

The machine and blacksmith shop is in a neat wood-frame building south of the plant. It contains a Landis Machine Company bolt and pipe-thread cutter, an F. and J. Barnes Company 22-in. drill-press, a Curtis and Curtis pipe threader and cutter and a Racine automatic hack-saw, all of which are driven from the same line shaft by a small electric motor. A double emery wheel with self-contained motor, a forge and blackmith outfit, and miscellaneous tools complete the outfit.

Pump House

Water is furnished by a pump house on the bank of the Little Miami River about 700 ft. west of the



Stone Screen and Elevator from Crushers at Miamiville. Note Speed Reducer Drives

Miamiville Plant from Southwest

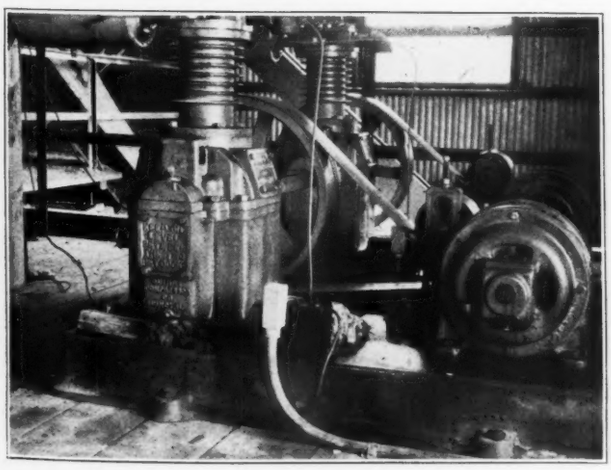
plant. This building has concrete foundations and pump pit with a superstructure of wood-frame and houses two Allis-Chalmers 8-in. Type SH centrifugal pumps, each with a capacity of 2,000 g.p.m. Each pump is driven by a 100-hp. motor.

Miscellaneous

Air for the hoists operating the bin and hopper gates is furnished by two single-cylinder vertical air compressors made by the Quincy Compressor Company, each of which is belt-driven by a 5-hp. motor. A 5-ton crane in the main building is used for removing any screen or other equipment. Another 8-ton crane in the crusher house handles any repair parts there. The plant office, a neat wood-frame building, contains the superintendent's office and a beam scale with a capacity of 40,000 pounds.

Officers

Officers of the American Aggregates Corporation are: F. D. Coppock, president; C. E. Patty, vice-president and general manager; Joe F. Coppock, assistant general manager in charge of operations; and J. C. Patty, chief engineer. Chesliegh Gray is district manager for Indiana, and F. E. Hauk is manager of the Indianapolis plant. F. W. Cornuelle is district manager for the Cincinnati district, and E. C. White is manager of the Miamiville plant.



Compressors Which Operate Air Gates at Miamiville

Construction of the Indianapolis plant was under the direct charge of G. D. Scheuneman, while construction of the Miamiville plant was under the charge of W. R. Purcell, who is also an engineer of the American Aggregates Corporation, located in the Cincinnati district.

A. S. T. M. Cement Committee Holds Important Meeting

Committee C-1 on Cement held three very well attended meetings during the Annual Meeting of the American Society for Testing Materials, Atlantic City, N. J., June 24-28. The Sub-Committee on Strength presented the results obtained to date in a cooperative study of the use of plastic mortars for an acceptance test of cement, which would also indicate the strength which the cement might develop in concrete. The data so far obtained are so promising that the sub-committee will continue the study during the coming year.

The chairman of the Sub-Committee on Masonry Cements led quite a discussion of these cements, which are so rapidly increasing in use.

The Sub-Committee on Apparatus presented for reference to letter ballot of the committee and, if accepted, for presentation to Committee E-10 on Standards for publication as tentative, effective January 1, 1930, tolerances to apply to all the equipment now used in testing cement. These are essential for the proper functioning of the Cement Reference Laboratory.

Committee C-1 approved for submission to letter ballot of the committee and, for submission to Committee E-10 on Standards, certain revisions in the standard for cement. The motions to be submitted include: (1) the changing of the title of the present standard so as to cover "portland cements" instead of "portland cement"; (2) the insertion of two sets of strength requirements in the standard, one for portland cement and the other for high early strength portland cement; (3) the making of the tensile strength requirements of the 1:3 standard mortar for portland cement 200 lb. at three days and 275 lb. at seven days, and for high early strength portland cement 275 lb. at 24 hours and 375 lb. at 72 hours; (4) the making of the 28-day test optional with the purchaser and when so desired the strengths not to be lower than those obtained in the seven day or 72-hour test (for portland cement or high early strength portland cement, respectively); and (5) placing a limit of 2.5 per cent on the sulfuric anhydride allowed in the high early strength portland cement.

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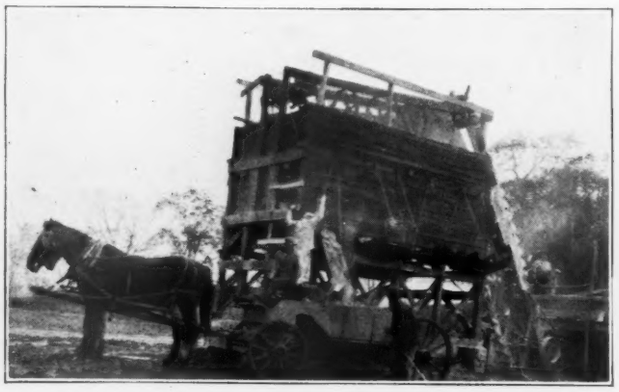
Temporary Crushed-Stone Plant Supplements in a Road-Construction Job

By F. A. WESTBROOK



Temporary Crusher and Screen on a Road Job

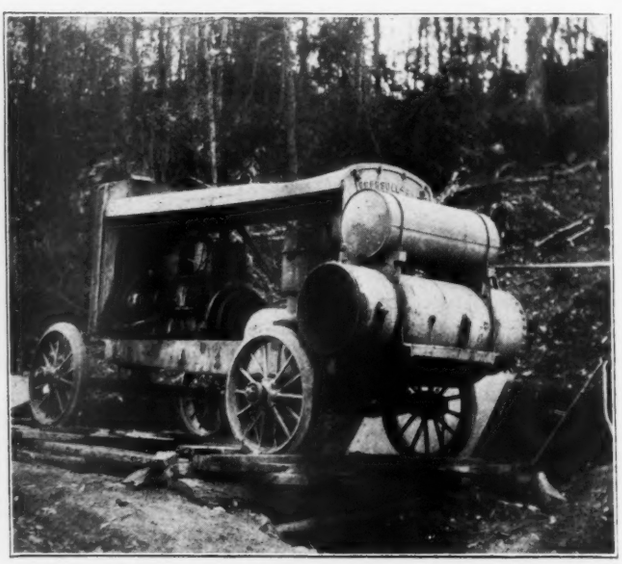
Portable Steam Engine Driving Crusher and Screen

A PORTION of the scenic state highway that runs northward from Ticonderoga, New York, along the west shore of Lake Champlain was under construction last summer, to the great disgust of numberless motorists who spent parts of their vacations visiting Fort Ticonderoga, Crown Point, and other places of historic interest in this beautiful country. The job was too far removed from any area of sufficient population density or industrial activity to be within the service range of commercial producers of crushed stone. Consequently—as has become more and more customary in the extension of first-class roads through sparsely settled regions—it was necessary for the contractor to operate a crushed-stone plant of his own, as a sort of side issue. In this case, not even electrical power was available.

This contracting firm, J. W. Haller & Company, was fortunate in locating a ledge of suitable stone close to the road that was being constructed. As will be seen from the illustration, very little stripping was required and it was an easy matter to get out the rock. Of course compressed air was necessary for drilling, which was done with Ingersoll-Rand jackhammers. An Ingersoll-Rand portable gasoline engine-driven compressor was carefully placed at the side of the road on a temporary structure as shown in the illustration and air pipes were run to the quarry.

After blasting, the stone was picked up by a Marion steam shovel and placed in trucks drawn by horses to the crushing and screening outfit furnished by the American Road Machinery Company. The crusher was set on the ground and a platform of timbers was constructed with an easy incline leading up to it. The stone was simply dumped from the wagons on the platform into the crusher,

(*Continued on page* 53)



Portable Gasoline-Engine Driven Air Compressor

Temporary Quarry for a Road Construction Contract

Annual Meeting of National Lime Association Elects Norman G. Hough to Presidency

Trade Practice Code Adopted and Submitted To Federal Commission for Approval

THE character of the entire procedure at the recent annual meeting of the National Lime Association was well described by the Honorable W. E. Humphrey, who, in the concluding minutes of the session at which the convention had submitted its proposed code of practices to the Federal Trade Commission, stated with emphasis that he had never known a practice conference to accomplish its purpose in such a short time. This fact was readily appreciated by those in attendance, for they realized how carefully every rule in the code must have been prepared before the convention by the manager of the association and they knew how few alterations had been deemed desirable during the open session at which this code had been discussed by representatives of the ntire lime industry.

The eleventh annual meeting started Wednesday forenoon, June 26, and terminated at noon of Friday, June 28. The program prepared by Norman G. Hough was carried out fully, with the exception of a scheduled address by Honorable Nelson B. Gaskill, former chairman of the Federal Trade Commission.

The first day was devoted to the adoption of a code of approved practices to be binding upon operators in the American lime industry—as mentioned above. Director M. Markham Flannery of the Trade Practice Conference division of the Federal Trade Commission presided at this important discussion.

It was during the forenoon session of the second day that this code was formally submitted to the commission. Commissioner Humphrey and Director Flannery presided jointly in a cordial manner that assured every member ample opportunity to express opinions. W. V. Brumbaugh acted as secretary of this conference, and announced that approximately 70 per cent of the lime industry's tonnage was represented by operators in attendance. One by one each of the proposed twenty-four rules was read aloud by Manager Hough, offered for discussion or revision, and accepted by vote. The code was then submitted officially to the Commission which accepted it for consideration some time after the summer recess. This proposed code is as follows:

Code of Trade Practices

Pledge: The persons, firms and corporations engaged in the production, sale and distribution of lime and lime products desiring to rid their industry of unlawful, unfair and uneconomic practices, and to secure to themselves the manifold benefits of lawful cooperation, pledge themselves to the observance of the following rules of fair competition and approved practice in the manufacture, sale and distribution of industry products, and respectfully petition the Federal Trade Commission for the approval of the same.

1. Price Discrimination: Not to discriminate unfairly in the prices charged to different customers of the same class for industry products; provided that this shall not prevent price dicrimination necessarily resulting from differences in the grade, quality or quantity of the commodity sold, or that makes only due allowance for necessary differences in the cost of selling or transportation, or discrimination in the same or different commodities made in good faith to meet competition.

2. Published Prices and Terms: To publish all prices and terms of sale separately and independently arrived at from time to time, and to adhere to such published prices and terms in dealings with all customers until new prices and/or terms are published, and then to put such new prices and terms into effect as to all customers of the same class.

3. Maintenance of Confidence and Stability: Not to put into effect changes in the established marketing customs and usages of the industry calculated to impair confidence or destroy stability in the industry without such reasonable notice as will enable the industry to meet such innovations on a basis of fair and open competition.

4. Secret Rebates: Not to allow to purchasers of industry products, whether dealers or consumers, commissions, bonuses, rebates, refunds, credits, unearned discounts, or subsidies of any kind, whether in the form of money, services, advertising, or otherwise, or give premiums, or extend to certain purchasers special terms, services, or privileges not extended to all purchasers under like terms and conditions.

5. Commercial Bribery: Not to give or permit to be given to the agents, employees or representatives of customers, or the agents, employees or representatives of competitors' cutomers or prospective customers, money or anything of value as inducement to cause their employers or principals to purchase or contract to purchase industry products, or to influence such employers or principals

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Norman G. Hough, President and General Manager, National Lime Association

to refrain from dealing or contracting to deal with competitors.

6. Inducing Breach of Contract: Not to willfully interfere with any existing contract between any other manufacturer and a wholesaler, retailer, consumer, or other party, involving or relating to the sale of industry products, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the business represented by such contract.

7. Selling Products Below Cost: Not to sell industry products below cost for the purpose of injuring a competitor and/or lessening competition.

> **Note**—The word Cost, as used in Rules 7 and 16, shall be construed to include among other items the cost of raw materials, transportation thereof, manufacturing, depreciation, depletion, obsolescence, fixed charges, selling and administrative expenses.

8. Defamation of Competitors: Not to defame or disparage a competitor, directly or indirectly, by words or acts which untruthfully call in question his business integrity, his ability to perform his contracts, his credit standing, or the quality of his product.

9. Fraudulent Containers: To observe strictly the provisions of the Act of Congress approved August 23, 1916. Pub. No. 228, 64th Congress, entitled, "An Act to Standardize Lime Barrels" in all transactions.

> **Note**—Said Act provides: "There is established a large and small barrel of lime, the large barrel to consist of two hundred and eighty pounds and the small barrel to consist of one hundred and eighty pounds, net weight.
>
> "It shall be unlawful for any person to sell or offer for sale lime imported in barrels from a foreign country, or to sell or offer for sale lime in barrels for shipment from any State or Territory or the District of Columbia, to any other State or Territory or the District of Columbia, unless there shall be stenciled or otherwise clearly marked on one or both heads of the small barrel the figures "180 lb. net" and, on the large barrel, the figures "280 lb. net" before the importation or shipment, and on either barrel in addition the name of the manufacturer of the lime and where manufactured, and, if imported, the name of the country from which it is imported.
>
> "When lime is sold in interstate or foreign commerce in containers of less capacity than the standard small barrel, it shall be sold in fractional parts of said standard small barrel, and the net weight of lime contained in such container shall be stenciled or otherwise clearly marked thereon, together with the name of the manufacturer thereof, and the name of the brand, if any,

R. C. Noll, Treasurer and General Manager, Whiterock Quarries

under which it is sold, and, if imported, the name of the country from which it is imported.

"Rules and regulations for the enforcement of sections 237 to 242 inclusive, not inconsistent with the provisions of said sections, shall be made by the Director of the Bureau of Standards and approved by the Secretary of Commerce and such rules and regulations shall include reasonable variations or tolerances which may be allowed.

"It shall be unlawful to pack, sell, or offer for sale, for shipment from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, any barrels or other containers of lime which are not marked as provided in sections 238 and 239, or to sell, charge for, or purport to deliver from any State or Territory or the District of Columbia, to any other State or Territory or the District of Columbia, as a large or small or a fractional part of said small barrel of lime, any less weight of lime than is established by the provisions of sections 237 to 242 inclusive, and any persons guilty of a violation of the provisions of sections 237 to 242, inclusive, shall be deemed guilty of a misdemeanor and be liable to a fine not exceeding $100.

"It shall be the duty of each district attorney, to whom satisfactory evidence of any violation of sections 237 to 242, inclusive, is presented, to cause appropriate proceedings to be commenced and prosecuted in the United States court having jurisdiction of such offense."

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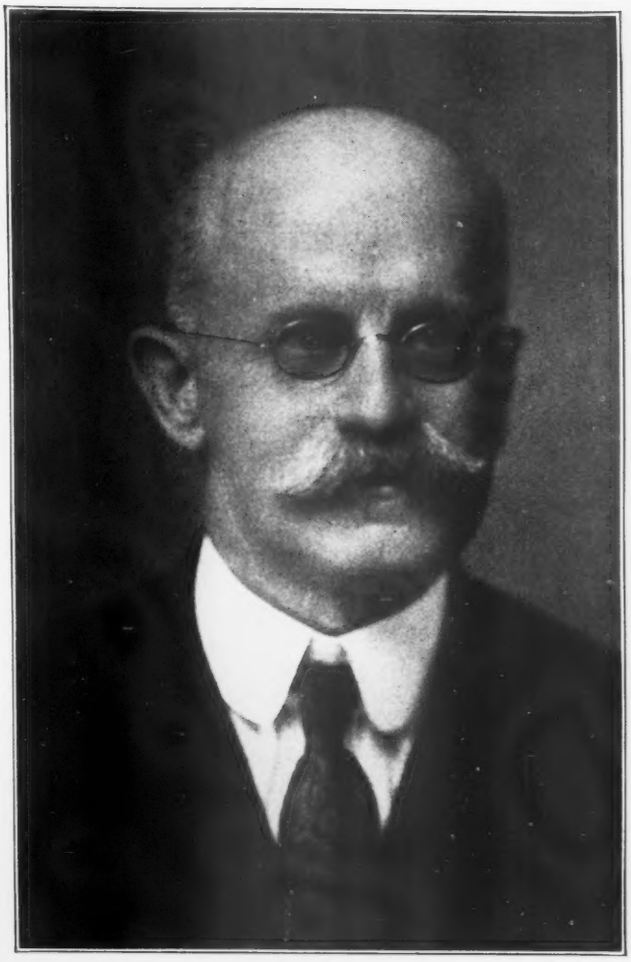
Charles M. Cadman, President, U. S. Lime Products Corporation, San Francisco, California



E. S. Healey, President, Glencoe Lime & Cement Company

10. Use of Old Packages: Not to sell lime or permit it to be sold in used barrels bearing the brand, label or name of a producer or dealer other than the one producing or selling the product contained therein where the purpose or effect may be to mislead or deceive the purchaser as to the source of production, grade, quality or quantity of such product.

11. Misrepresentation: Not to sell or offer for sale any industry product for the purpose or with the effect of deceiving customers or propective customers as to the quantity, quality, or grade of such product.

12. Imitation of Trade Marks and Trade Names: Not to imitate or to simulate in such degree as to give rise to uncertainty or confusion the trademark, trade name, package, brand or label of a competitor.

13. False Branding: To be scrupulously accurate in all markings, brands and labels and to avoid any and all shipments the purpose or effect of which may be to mislead or deceive purchasers as to the quantity, quality, grade or substances of the goods purchased.

14. Deviation from Standards: Not to deviate from the established practices of the industry as

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J. R. Linney, Vice-president, Chazy Marble Lime Company, Inc.

regards the grade, quality or substance of standard industry products, or the size of packages or containers for such standard products.

15. Inducing Sales by Other Products: Not to offer any article or commodity, whether an industry product or not, at prices below those prevailing in the competitive market or at less than their fair value, or without a profit, as inducement for the purchase of one or more industry products.

16. Cost Accounting: To observe approved cost accounting methods in the conduct of business.

17. Anti-dumping: Not to ship quantities of merchandise into territories remote from the territories customarily served for the purpose of selling them at prices below the market in such remote territories.

18. Consigned Goods: Not to ship lime or lime products on consignment.

19. Transit Shipments: Not to make any shipments other than those involving mere transfers of materials to the warehouses or plants of the shipper without having an order from the customer for the shipment at the time shipment is made.

20. Discrimination by Brokers, Jobbers and Distributors: That lime manufacturers who sell their products through brokers, jobbers or distributors, wholly or in part, shall use their best efforts to bring about the observance of these rules of approved practice by such brokers, jobbers or distributors.

21. Definition of Jobber or Distributor: A jobber or distributor shall be defined as any person, firm or corporation who is engaged in the business of selling lime or lime products, either exclusively or with other materials, but is not engaged in the manufacture of the particular type or class of lime or lime products, and who sells the materials to another person, or to another firm or corporation in which he is not financially interested, for purposes of resale, and who carries the account and/or is responsible for the credit risk of the shipment.

22. Conference Information: The Trades Relations Committee of the National Lime Association is hereby constituted the source within the industry from which manufacturers may secure information relating to the Trade Practice Conference and all rules adopted thereby.

23. Continuation of Conference: Resolved that this conference of the lime industry be continued as a permanent conference for the suppression of unfair trade practices and that the Trade Relations Committee of the National Lime Association investigate alleged violations of these resolutions and make complaints to the Federal Trade Commission, and, if deemed advisable, such Trade Relations Committee may request the Federal Trade Commission from time to time to call new conferences of the industry for the purpose of amending those resolutions.

Resolved further that such committee be authorized to send its accredited representative from time to time to the places of business of any or all manufacturers to make such investigations or inspections as may be necessary to determine whether the resolutions adopted by this conference are being observed in letter and in spirit.

24. Approval of Changes: The Trade Relations Committee of the Lime Industry is hereby authorized on behalf of the Industry to approve or disapprove any changes or modifications made by the Federal Trade Commission in the Resolutions adopted at the Trade Practice Conference on June 27, 1929.

Before this session adjourned, A. F. Myers, legal counsel for National Lime Association, and formerly a member of the Federal Trade Commission, paid a tribute to the gentlemen of the Commission, and a rising vote of appreciation was registered by the members in attendance. Commissioner Humphrey made a happy response.

At the Thursday afternoon session, the routine business included roll call, followed by the reading

of the minutes of the preceding annual meeting held in New York City, May 23-24, 1928.

Reports by districts indicated the election of the following directors for the next year.

District 1—J. R. Linney, Chazy Marble Lime Company, Lyon Mountain, New York; C. L. Montgomery, superintendent, Vermont Marble Company, West Rutland, Vermont.

District 2—Reed C. Bye, vice-president, The Warner Company, Philadelphia, Pennsylvania; S. Walter Stauffer, salesman, J. E. Baker Company, York, Pennsylvania.

District 3—Ray C. Noll, general manager, Whiterock Quarries Company, Bellefonte, Pennsylvania.

District 5—George J. Whelan, president, The Kelley Island Lime & Transport Company, Cleveland, Ohio.

District 6—George J. Nicholson, vice-president, Inland Lime & Stone Company, Manistique, Michigan.

District 7—E. S. Healey, president, Glencoe Lime & Cement Company, St. Louis, Missouri; B. L. McNulty, Marblehead Lime Company, Chicago, Illinois.

District 9—Henry LaLiberte, vice-president and general manager, Cutler-Magner Company, Duluth, Minnesota.

Districts 10, 11—L. J. Backus, vice-president, Ladd Lime & Stone Company, Cartersville, Georgia.

District 12—J. F. Pollock, vice-president, Ash Grove Lime & Portland Cement Company, Kansas City, Missouri.

District 13—H. Dittlinger, president, Dittlinger Lime Company, New Braunfels, Texas.

District 14—John S. McMillin, president, Roche Harbor Lime & Cement Company, Roche Harbor, Washington.

District 15—C. M. Cadman, president, United States Lime Products Corporation, San Francisco, California.

Election of directors had not been held in Districts 4 and 8.

As stated in the July 3 issue of PIT AND QUARRY, these directors elected Norman G. Hough president of the association. He retains his managerial position.

Annual Dinner

On Thursday night, a complimentary banquet and entertainment was tendered to those in attendance at this meeting by the Valve Bag Company of America.

The new executive committee comprises:

J. M. Gager, president, Gager Lime Manufacturing Company, Chattanooga, Tennessee.

Reed C. Bye, vice-president, The Warner Company, Philadelphia, Pennsylvania.

J. M. Deely, vice-president, Lee Lime Company, Lee, Massachusetts.

H. B. Matthews, Jr., vice-president, Mississippi Lime and Materials Company, Alton, Illinois.

R. P. Wilton, of Steacy & Wilton Company, Wrightsville, Pennsylvania, was re-elected treasurer and elected secretary.

W. V. Brumbaugh, heretofore secretary of the association and assistant to its general manager, was elected assistant secretary-treasurer.

One important matter of business pertained to recommended revisions of the association's constitution and by-laws that were adopted ten years ago. The only significant change made was in Article 3 which now reads:

George J. Whelan, President and General Manager, Kelley Island Lime & Transport Company

Article 3.—The object of the Corporation shall be to promote the general improvement of the industry of manufacturing and selling lime and lime products; to foster the interest of its members and those in any way related to the lime industry by common business interests; to secure freedom from unjust exactions or legislation; to develop higher standards of business practice in the industry; to establish uniformity in the customs of the industry and commercial usages of the products; to acquire, preserve and disseminate valuable business information; to promote an enlarged and more friendly intercourse among those engaged in the industry; to promote the growth of the industry through expansion of its possibilities and by developing a wider market for its products through researches, investigations and through the dissemination of facts to consumers and the public; and the doing of all things incidental or conducive to the attainment of the above objects not inconsistent with the public interest, the certificate of incorporation, or the laws of our land.

In his report Mr. Hough expressed his vision of a substantial expansion in the membership and activities of the association. Besides the benefits that will attend a code of business practices, significant progress will attend the association in its proposed employment of an expert agronomist to conduct researches in the beneficial applications of

(*Continued on Page* 80)

Technical Aspects of Slurry Filtration

Part II

By C. H. SONNTAG

IN THE installment published on page 81 of the July 3 issue of PIT AND QUARRY, *the author opened this discussion by comparing cement manufacture with other industries. He discussed some of the mechanical equipment used in slurry filtration. In this part, he is concerned with the chemical combinations of the raw material and their effect on filtration.—Editor.*

Straight Stone Slurry

This much resembles that made from slag, being free-filtering. Unfortunately there is great variation in the physical properties of cement stone in various sections of the country. Some is granular or crystalline, and its clay content is not very apparent except by analysis. Others hardly resemble limestone at all, but look more like slate. The Lehigh Valley cement rock is the outstanding example of this, but certain stone in Colorado falls in this class also.

The crystalline limestones have usually been highly metamorphosed, almost approaching marble, and the clay they contain has lost much of its colloidal nature. In fact, careful study might show that it is not clay or shale at all in the ordinary sense, but other minerals derived from them. It is possible that such clayey material is not completely separated from the lime during grinding. Such stone makes a slurry that is very free-filtering. On the other hand, Lehigh Valley rock is so fine-grained that it may become colloidal when finely ground with water. Since there are no filters in operation in the valley, the action of this stone on an operating scale is not known.

Limestone and Shale

Shale is, mineralogically speaking, only hardened and compacted clay. When ground alone with water it does not require so much of the latter to make a pumpable slurry as does soft clay, and hence is not quite so colloidal. It is sufficiently so, however, definitely to retard filtration, so that a filter for use on a slurry-containing shale must be larger for equal production than one using the materials previously mentioned.

Limestone and Clay

Most of the clays used for cement making in the northern part of the country are the result of glacial action, combined with sedimentation in water. The latter action has segregated the very finest particles of glacial detritus into deposits such as are being worked to-day. The power of these particles of retaining water, or adsorption, as it is called, has been very highly developed, and most of them are ultra-microscopic in size. They are so fine and hold water so tenaciously that many straight-clay slurries must contain 60 per cent of water to be pumpable.

These tiny particles, which seem to have some of the properties of jelly or glue, stop up the meshes of the filter cloth and also the pores of the cake, and retard the passage of water through it. It is for this reason that a filter handling slurry containing clay must be so much larger than one running on more granular material. The addition of 6 per cent of clay to a straight limestone slurry reduces the filtering rate 20 to 25 per cent, and the rate on pure clay slurry is very low. In spite of this, filters have found an important place in dewatering pure clay slip in the ceramic industry. Clays vary so much among themselves that only experiment can determine the behavior of any particular one on a filter.

Marl and Clay

While the installation of filters is well worth while in any wet-process cement plant, the chance for greatest savings is in those using marl and clay as raw materials. Marl is itself somewhat colloidal, and, in addition, it practically always contains a good deal of organic matter that is extremely retentive of water. Much of this organic matter seems to be of the nature of peat, and the difficulties of drying peat are well known.

To make a bad matter worse, practically all marl plants use glacial clay, and the amount of water that must be mixed with it and the difficulty of filtering it have just been mentioned. The result is that marl plants usually run with a slurry that is half water, which must be evaporated in the kilns with the penalty of high fuel consumption and low production.

A filter will take out half the water in a marl slurry—a somewhat greater reduction than is usually possible with other raw materials—and the results in fuel saving and in increase of production can be imagined.

Feeding Filter Cake

All filter installations now running handle the cake in the same way. It drops from the filter on to a belt conveyor and is discharged over the head pulley, falling directly into the feed hopper. The feeder consists primarily of a water-jacketed hopper. In it is a removable unit consisting of an inclined-screw conveyor with its guide and thrust bearings. The latter are enclosed in a pipe so as

to be protected from dust and properly lubricated. The conveyor should run at about 100 r.p.m. This arrangement is necessary because filter cake will not flow into the kiln by gravity, as will dry mix or slurry.

Disposal of Flue Dust

In dry mills the dust collected in the stack bases and flue-gas passages may be mixed with the feed without trouble. In wet plants it has not usually been found wise to add it to the slurry because of its thickening action, and now it is commonly fed into the kiln feed pipe and washed down by the slurry. Mills using filters have found that the flue dust may be dropped into the feed screw with the filter cake with entire satisfaction.

Influence of Variable Water Content

Heretofore wet plants have been particular to run with the lowest possible percentage of water in the slurry so as to keep down the fuel consumption per barrel. When filters are used the importance of this is not quite so great, for the cake will normally carry about the same moisture in any event. An increase in the water content of the slurry does, however, require greater filter area to produce the same tonnage. The test leaf will give good enough preliminary figures, and in any event a filter should be bought large enough to give a reasonable allowance for contingencies.

Temperature of the Slurry

Experiment has shown that within limits a warm slurry filters more easily than a cold one. This is to be expected, since the viscosity of most liquids decreases with rising temperature. The work put into slurry in grinding it naturally heats it, and one of the filter manufacturers has suggested that the temperature be raised still higher by feeding the mills with hot water, using for that purpose the overflow from the water jackets of the kiln feeders.

There is, however, a practical limit to this, since hot slurry would give off large quantities of water vapor that would have to be handled by the vacuum pump, and it is impossible to maintain a high vacuum in the presence of hot water. At 108 deg. F. a saturated mixture of air and water vapor contains about 50 per cent of the latter at atmospheric pressure, and under even a moderate vacuum the percentage would be far greater. It would seem that, when filtering hot material, some form of condenser should be interposed between the filter and vacuum pump. If the filtrate carries lime or any other compound in solution, excessive evaporation inside the filter might leave a deposit of salts in the pores of the cloth, tending to clog it up.

Re-use of Filtrate

Many mills have an abundant supply of water on their property, and with them a saving of water is not of much importance. Some must buy their water from a public service company at meter rates, and for them a reduction in the use of water means a reduction in money paid out. In the first instance, the water withdrawn by filters may be run to waste with no loss other than that of the sensible heat in it. In the second, the filtrate may be used as part of the supply to the raw mills, of which it should make nearly half. Being more or less warm, it will serve to raise the temperature of the slurry and aid the filters in their work.

Choice of Operating Procedure

The removal of half the water in the slurry makes possible one of two things, as compared with the previous operation. First, the kilns may continue to run with the same feed, turning out the same amount of clinker at a fuel saving of 20 per cent or more, which means less fuel burned per day. Second, the same weight of fuel may be burned per day as before, and the kiln feed increased as far as the production of good clinker will permit. It is for the individual operator to choose which of these plans he will adopt, or whether he will compromise by using a part of the possible production increase, thus getting partial benefits from both methods.

The equipment in the rest of the mill will probably determine the plan to be followed. If the grinding departments are already worked to capacity, and no additional machinery is contemplated, then the first plan should be adopted, and full advantage taken of the possible fuel saving, since increased production is not possible. If there is plenty of grinding capacity, and the kilns have been the "neck of the bottle," the second plan or some compromise will be the better choice unless it is definitely decided not to increase production. Such a decision might be a very wise one in times of slack sales and intense competition.

It is a part of the operating policy of some companies to force kilns just as far as may be, regardless of fuel economy. While there is considerable room for argument on this point, we are concerned with its possibility when using dewatered slurry. There is not much question that the removal of so much water makes it possible to burn more fuel in the kiln than was previously used, provided enough air is introduced to complete its combustion. Here the question of stack capacity must be considered. The stack must be able to withdraw from the kiln the gases of combustion and calcination and the water vapor as fast as they are liberated. Its ability in this matter limits the amount of fuel that can be burned in the kiln in unit time. This point is mentioned here because some rather optimistic claims as to possible kiln capacities on dewatered slurry have been made, and there is a likelihood that limited stack ca-

pacity may prevent their realization. In any event, forcing a kiln is usually at the expense of fuel economy, and possibly of refractories also.

Complete Dehydration of Slurry

It is, of course, theoretically possible to remove all the water in slurry, but the writer has not seen any apparatus that seemed to be well adapted to do this. Complete dehydration would be the equivalent of operation on the dry process as far as the kilns are concerned, and the drying could be done by the heat in the stack gases, but in separate drying equipment. The fuel saving and the increase in clinker production that appear to be attainable by removing the last half of the slurry water are nowhere near as great as those resulting from the removal of the first half, and, so far as we now know, complete dehydration would be far more expensive and complicated than simple filtration. In the present state of the art it hardly seems worth while. Artificially-induced draft would probably be necessary, and that is costly both in power and equipment, aside from the chance of overheating and damaging the whole drying apparatus.

Cost and Savings

Aside from the purely engineering features, two questions naturally arise in the mind of one considering the use of filters: The first, what will be the first cost ready to operate? and second, how soon will this cost be repaid by the economies effected? Neither of these can be answered categorically, for they depend on the nature of the slurry, the ease or difficulty of placing the equipment in any particular mill, and the way the plant is run after the filters are in use. This last point refers especially to the choice between satisfaction with the original production or taking advantage of the increased kiln output that filters make possible. As a very rough approximation it may be stated that a complete installation for one kiln that is turning out 1,600 barrels per day from slurry made from limestone with no added clay or very little of it, and carrying 35 per cent of water, will cost between $35,000 and $40,000, or around $22 to $25 per barrel of original daily production. The time in which this investment will be returned will depend entirely on the subsequent operating policy.

Cost and Reimbursement Data

As indicative of how the economics of filtration should be worked out, a typical calculation follows. Like all such figures, they are based on certain assumptions, which are:

Mill charges that will fluctuate in inverse ratio to production are 60c per barrel.

A kiln produces 1,500 barrels per day for 283 days per year.

Coal costs $5 per net ton delivered at the plant.

Present coal consumption is 125 pounds of undried coal per barrel, railroad weight, on which basis it is paid for.

The use of filters will effect a saving of 20 pounds of coal per barrel.

The use of filters will permit an increase of kiln output to 2,000 barrels per operating day.

Filters can be installed ready to run for $35,000 per kiln.

(a) Increase in production, per cent	0	20	33 1/3
(b) Daily production, bbl.	1,500	1,800	2,000
(c) Coal saved per bbl., lb.	20	20	20
(d) Coal saved per day, lb. (b×c)	30,000	36,000	40,000
(e) Coal saved per day, tons, (d÷2,000)	15	18	20
(f) Value coal saved per day @$5. (e×5)	$75	$90	$100
(g) Fixed charges per day, (1,500 bbl.×$0.60)	$900	$900	$900
(h) Fixed charges per bbl. ($900÷b)	$0.60	$0.50	$0.45
(i) Saving in fixed charges per bbl. ($0.60−h)	.....	$0.10	$0.15
(j) Daily filter operating cost	$20	$20	$20
(k) Filter operating cost per bbl. (j÷b)	$0.013	$0.011	$0.01
(l) Fixed charges on filters per day (15% on $35,000)	$14.39	$14.39	$14.39
(m) Daily saving due to increased output (b×i)	.....	$180	$300
(n) Total operating and fixed charges of filters per day (j+l)	$34.39	$34.39	$34.39
(o) Gross profit per day (f+m)	$75	$270	$400
(p) Net profit per day (o−n)	$40.61	$235.61	$365.61
(q) Investment released in days ($35,000÷p)	862	148	96
Savings per year of 283 days (p×283)	$23,671.07	$133,941.07	$207,521.07

If the output of the kilns is not increased, and profit is taken only on the coal saving, the filters will pay for themselves in 862 days, or a little over two years, and thereafter yield a profit of $11,500 a year per kiln.

If the output of the kilns is allowed to increase 20 per cent, saving will be made both in lowered coal consumption and lowered fixed charges per barrel. On this basis the filters will pay for themselves in about five months, and thereafter yield a profit of $66,600 a year per kiln.

If the output of the kilns is allowed to increase 33 1/3 per cent, the filters will pay for themselves in 3 months and thereafter give a profit of $103,500 a year per kiln.

The possible profits under the last two paragraphs depend on the ability to sell the increased output at a profit. If this can be done, the profit on all over 425,000 bbl. per kiln per year should be credited to the filters.

In the foregoing discussion the question of overhead charges on the general plant investment has not been considered. Let us, as a basis for figuring, take this as 15 c. per barrel. If production is increased, this charge per barrel will be automatically reduced as follows:

(a)	Percentage increase.	0	20	33 1/3
(b)	Production, bbl.	425,000	510,000	566,666
(c)	Overhead per bbl. 15c. ÷ (1+a)	15c.	12.5c.	11.25c.
(d)	Saving per bbl. (15c—c).	.....	2.5c.	3.75c.
	Annual saving (b×d)	.....	$12,750	$21,250

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How a Perfect Safety Record Was Attained at the Ironton Alpha Plant

By F. C. BROWNSTEAD*
Superintendent, Alpha Portland Cement Company, Ironton, Ohio

THE fact that the Ironton plant of the Alpha Portland Cement Company has gone through two successive years without a lost-time accident has made it the recipient of many inquiries as to the manner in which we carry on our safety activities. Like all other organizations, we are constantly experimenting and the method we use to-day may be discarded to-morrow, so it is impossible to lay our finger on any one thing and say it is responsible for our success.

Regardless of what methods are used, the whole secret lies in the two words: "Education" and "Co-operation." These words have been used so often that they may sound monotonous, but the fact remains that they are the foundation of all accident prevention. No one will question the statement that nothing can be accomplished without cooperation. Years ago, many of the officials and plant superintendents were luke warm towards safety and, as a result, little progress was made. You can never create enthusiasm among employees over anything unless they are shown by word and deed that the management is sincere. The spirit of safety is only contagious when it starts at the top and works downward.

In regard to the other half of our prescription: "Education." We must make our fellow workman realize that accident prevention is not primarily a question of dollars and cents, but of saving human life. It is attempting to prevent men from losing eyes, arms and legs which can never be put back. It is trying to prevent the making of widows and orphans, destitution and misery. Neither our officials nor the laws can do it, but we can do it.

Most Accidents Are Preventable

We all know that most accidents are preventable; that they are due to carelessness or thoughtlessness, to unlawful practices on the part of workmen and not to defective machines. It should not be taken for granted that every man knows the safe and unsafe ways of doing his work; neither should we assume that without any special instruction he will take the safe course. Many accidents are undoubtedly caused by sheer carelessness, yet how often would what on the face of things appears to be carelessness turn out to be simply ignorance as a result of lack of instruction.

The safety work at the Ironton plant is not conducted by a safety supervisor or any one hired especially for this purpose. Our safety committee is composed entirely of foremen or heads of departments. Considerable experimenting was done and various combinations were tried in order to get the best committee possible, but we found that the foreman is the logical man to have on the committee; in fact, we made but little progress until we placed the responsibility on the foreman.

F. C. Brownstead

Our regular meetings are held once a month with additional meetings called whenever it is deemed necessary. After a shut-down period we call all the men together a day or two before the plant is started for a general meeting. Several outside speakers are usually obtained for this occasion and they remind the men that they may be a bit rusty due to their lay-off and urge them to be careful.

Chairmen Rotated and Meetings Varied

Until 1928, all of our regular meetings were in charge of the chairman of the committee, but last

* Abstract of a paper presented at the Regional Safety Meeting, Newcastle, Pa., June 18, 1929.

year we gave each foreman charge of one meeting. This man is chairman of the committee for one month and is in charge of all safety activities during that month. Aided by the men in his department, he makes all inspections and investigations. We found that this arrangement created a friendly rivalry that made each foreman anxious to add another clear month to our safety record. It also makes the foreman in charge feel an added responsibility and causes him to take a greater interest than before.

Our meetings too, were more varied and interesting as each foreman would add something unusual to his program. For example, our mine department brought in their first aid team and put on a first-aid demonstration. The power department organized a quartette and sang a safety song, the words and music of which were written by the power-department foreman.

Eye Protection a Specialty

Of all the phases of safety work there is none, we believe, that has a greater appeal than that of eye protection. In the loss of a finger, a hand, an arm or a limb there is, of course, the element of tragedy, but not the deep, pathetic tragedy that shrouds a life in darkness when the priceless possession of sight is lost.

The Ironton plant, we believe, was one of the first to equip each man with a pair of goggles and make the wearing of them compulsory. Prior to 1925 we were having a great number of eye accidents, men were being struck by flying chips of stone and steel and losing the sight of an eye. So a compulsory-goggle rule was put in effect in April, 1925. Each man was given a pair of goggles and a letter explaining the reason and also instructions as to when they must be worn, as well as the penalty for not wearing them.

These goggles were purchased by the company at $1.10 per pair and this amount was deducted from each man when he received his pair. The company keeps the goggles in repair free of charge and when a man leaves the service his $1.10 is refunded to him provided he returns the goggles, no deduction being made for the condition of the goggles when they are returned.

Plant Physician Can Cooperate

It is impossible to place too much emphasis on the part played by the plant doctor in holding down the number of lost-time accidents.

It is our rule that every new man must be given a thorough physical examination before he goes to work and every old man is given a periodical examination. By this arrangement the unfit are kept out of our plant and a line is kept on our regular men so that if anything develops which might make them unable to take care of their regular job as they should, they can be transferred to another job.

The real company doctor is one in whom the men have confidence. He should be a ready and sympathetic listener to all their troubles, both real and imaginary, so that the men will be anxious to come to him for treatment and advice.

Preventing Lost Time

We make every effort to keep a man from losing time but we do not insist on a man staying on the job if he is unable to work, neither do we allow a man to sit around and do nothing merely to keep our record intact. If a man receives a slight injury which may handicap him on his regular job, we transfer him to some other job temporarily but under no circumstances do we create a job for him. In our desire to establish records and win trophies, we are apt to forget that our fight is to eliminate accidents and these records and trophies mean nothing if we have not reduced not only our lost-time accidents, but also the number of our no-lost-time accidents.

We of the Ironton plant feel greatly indebted to the Portland Cement Association and to them should be given no small share of the credit for the record we have made. In our opinion, the monthly report entitled "Significant Accidents" is one of the most valuable bits of information put out by this organization. This report is given a thorough study in our committee meetings and an attempt is made to visualize each accident described. If we find that a similar accident is liable to occur at our plant we take immediate steps to head it off.

Each foreman is given a copy of this report and in addition to this we make up another report covering the accidents which are peculiar to his department. The latter report is first read and explained to his men and then placed on the department bulletin board.

Safety Bonus Plan

After all has been said and done, there is nothing that so impresses the men that their company is really trying to cooperate with them in the reduction of accidents as a little addition to their pay check. Banquets, barbecues and entertainments that may mean the outlay of $500 or $600 serve their purpose, but it has been our experience that $100 distributed among all the men gives far better results.

The Alpha plan is to add to each man's check one per cent of his earnings whenever the plant goes through a month without a lost time accident. The average monthly bonus per man at our plant would be about $1.25, but it is surprising how our men count on this addition and how they appreciate it.

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Accounting Practices for Cement Mills

Part II

By J. J. BERLINER

IN THE first installment of this article, published on page 87 of the July 3 number of PIT AND QUARRY, *the author outlined systems of cost accounting and plans of organization for a successful cement manufacturer. In this concluding section he further explains what was discussed in the first installment and reduces factors to assets and liabilities.—Editor.*

There is no question but that a leasing company must take back its own sacks. In this connection, in order to know what its obligation is, the company must keep its books in such a manner that its liability is always reflected. It is rather important that this Customers' Sack Deposit account be shown on the balance sheet separately from all other reserves or liabilities.

By referring to the balance sheet the executive can tell what the company's liability for this item is; and, from other statistics, approximately how much will be liquidated monthly as well as how many sacks are still outstanding.

Auxiliary accounts should be kept, either in the customers' ledger or in some other way, to show how many sacks are outstanding in the hands of each customer, which total should equal that shown by the controlling account, Sacks in Customers' Hands.

Another item, however, which must be disposed of currently, preferably at the end of each month, is the useless sacks returned by the customer for which he is not allowed credit. Owing to the lack of proper care by the customer, sacks frequently become useless, because they are wet, torn beyond repair, or improperly handled. Useless sacks should be accounted for separately, in the following manner: At the end of each month, in order to get them out of the accounts, the following entries should be made: charge Customers' Sack Deposit account with 10 cents each for all useless sacks returned during the month; credit Sacks in Customers' Hands, with the average inventory price of 15 cents each; and charge the difference of 5 cents each, which represents the difference between inventory value and the amount of deposit the customer has made for which he will not receive credit, to Profit and Loss on Sacks Developed Useless. The number of sacks represented in Sacks in Customers' Hands and the Customers' Sack Deposit account should always be the same, and should balance with the individual customers' records as to numbers, as stated previously.

The accounting for sacks by a selling company should be the same as by a leasing company, because, whether sacks are sold or leased, the agreement is that they shall be returned to the cement companies within a reasonable time; but, in order to meet some of the views of the selling companies, a distinction in the accounting is made, to take care of this difference, which is only technical.

When a company sells its sacks, a slight modification of the foregoing entries is necessary. General accounts will be the same as in a leasing company, except that accounts, Deferred Sack Losses and Unearned Profit on Sacks, will be added, and Sacks in Customers' Hands and Customers' Sack Deposit accounts dropped.

The Sack Inventory account will be credited with the sacks shipped, at the average inventory price of sacks, which is 15 cents each and Customers' Accounts Receivable (Sales ledger) will be charged with 10 cents for each sack shipped. The difference between the average inventory price and 10 cents billed the customer will be charged to an account called Deferred Sack Losses; or, if the inventory is less than 10 cents, the difference will be credited to an account called Unearned Profit on Sacks. When the customer returns the sacks, the two latter entries of course, will be revealed. In a selling company, the useless sacks returned are handled in a slightly different manner from that of a leasing company. A journal entry should be made when useless sacks are returned, charging Profit and Loss on Sacks Developed Useless, and crediting Deferred Sack Losses with the difference in the cost to the company and the amount charged to the customer, which, in the illustration, is 5 cents per sack; or, if the cost to the cement company is less than the 10 cents charged to the customer, then the difference should be charged to Unearned Profit on Sacks and credited to Profit and Loss on Sacks Developed Useless. Auxiliary accounts must be kept, showing the amount of sacks outstanding at all times, the same as in a leasing company.

Another important item in regard to this sack question must be considered. A certain percentage of sacks shipped will never be returned. Hence some adjustment must be made, which is an estimate based upon past experience. This record in most cement companies is complete. Statistics show that, over a period of years, approximately 8 per cent of the total sacks shipped will never be returned. Each month 8 per cent of the shipments should be written out of the accounts. For illustration, assume that, in a leasing company in a given month, 100,000 sacks are shipped out, which cost 15 cents per sack, and are billed to the customer

at 10 cents per sack. There will be a loss of 8,000 sacks at 5 cents each, or $400. The inventory account, Sacks in Customers' Hands, should be reduced by 8,000 sacks, amounting to $1,200, and the Sack Deposit account reduced by $800; the profit and loss should be charged to an account styled Profit and Loss on Sacks Destroyed in Service, $400.

If the price of sacks to the cement manufacturer be reduced to less than 10 cents per sack, some of the figures will be shown as profits instead of as losses, but this does not mean that there is a profit to the cement companies in the handling of these sacks.

A selling company will charge Loss on Sacks Destroyed in Service and credit Deferred Sack Losses, with the difference between the cost of 15 cents and the charge to the customer of 10 cents on 8 per cent of its shipments; or, if the cost to the cement company is less than 10 cents, the difference should be charged to Unearned Profit on Cloth Sacks, and credited to Profit and Loss on Sacks destroyed in Service.

The above accounting methods do not take into consideration the handling charges, such as unloading, counting, inspecting, mending, sorting, cleaning, and other charges incurred in the handling of sacks at the cement mills when returned by customers. These charges, which are numerous and large, are charged to cement manufacturing costs; they amount to many hundreds of thousands of dollars per year.

It is obvious that, in the handling of the accounting for cement sacks in a large cement company, the shipments of which are in excess of 12,000,000 barrels of cement per year, and which would take, if sacks made only one trip, a total of 48,000,000 sacks annually, each sack cannot be accounted for separately and individually, but must be handled in totals, as explained.

The above methods were worked out, primarily to show a proper accounting procedure when no earnings or losses have taken place, except in useless sacks returned (which is almost negligible) and the per cent that will never come back, which is written out of the accounts as shipped.

Assets

The bulk of the assets of the cement business is composed of heavy, expensive machinery, which is operated 24 hours a day during the periods of activity, grinding heavy, gritty substances, such as slag, limestone, coal, and materials of like nature. The life of such machinery is short, because the grinding and burning of these materials cause heavy repairs. This fact makes it necessary to apply heavier depreciation and renewal charges than in ordinary lines of manufacture.

Another point to consider is the fact that the cement business is largely a seasonal one; therefore, its financial needs must be so planned that its seasonal needs may not throw its yearly necessities out of alignment.

The quarries of each plant must be governed by local, or individual, quarrying conditions, as no fixed rule can be laid down to cover every condition, except that some charges should be made in monthly costs and credited to Reserve for Depletion until such reserve equals the purchase price of the quarries.

The following condensed classification of accounts will serve to indicate the nature of the asset accounts:

Asset Accounts

Current Assets
- Cash
- Accounts Receivable
- Customers
- Advances
- Bills Receivable
- Inventories
- Raw Materials
- Clinker
- Cement
- Gypsum
- Coal (kilns, steam)
- Packages (sacks, barrels, paper bags)
- Work in Process

Deferred Charges
- Shut-down Expense
- Exploration and Development
- Insurance Unexpired
- Investments

Fixed Assets
- Machinery
- Buildings
- Mill Land
- Quarry Land
- Valuation Accounts (Reserves)
- Depreciation
- Valuation Accounts (Reserves)
- Depletion of Quarry Lands
- Doubtful Accounts

Liabilities and Net Worth

The liability and net worth accounts of a cement plant deserve no special comment, with the exception of the Sack Deposit Liability Account, described under Returnable Sack Accounting. The following condensed chart of accounts will serve to indicate the nature of the liability and net worth accounts.

Liability and Net Worth Accounts

Current Liabilities
- Bills Payable
- Trade Accounts Payable
- Unclaimed Sacks
- Payroll Accrued
- Bond Interest Accrued
- Royalties Accrued

Reserves
- Contingencies
- Redemption of Sacks (unearned profit)

Fixed Liabilities
- Bonds Payable
- Mortgages Payable

Net Worth
- Capital Stock
- Surplus
- Profit and Loss

Classification of Nominal Accounts

The following classification of nominal accounts will be found necessary where it is desired to obtain process costs for the valuation of inventories of material in process and the finished product. Most manufacturers of cement, however, do not attempt to allocate general and administrative expense to the quarries and the respective departments of the mill. This method while not theoretically correct, is usually accepted as more practicable, and gives reasonably correct costs for the valuation of inventories in process and the finished product.

The "bin cost" of the cement is determined by a summary of the manufacturing accounts, and, by adding the sack and shipping expenses, the "cost on board cars" is obtained.

Manufacturing Accounts

Quarry Section (Raw Material No. 1):
Operating Labor
Operating Supplies
Fuel
Explosives
Miscellaneous Supplies
Depletion of Quarry Lands
Pro rata share of general and administrative expense.

Quarry Section (Raw Material No. 2):
Operating Labor
Operating Supplies
Fuel
Explosives
Miscellaneous Supplies
Depletion of Quarry Lands
Pro rata share of general and administrative expense.

Mill Section
Raw Grinding Department
Raw Material No. 1
Raw Material No. 2
Fuel
Operating Labor
Pro rata share of general and administrative expense.

Clinker Burning Department
Raw Ground Material
Fuel
Operating Labor
Pro rata share of general and administrative expense.

Clinker Grinding Department
Clinker Used
Gypsum Used
Operating Labor
Pro rata share of general and administrative expense.

General Overhead Expense (Prorated over direct producing departments, according to benefits derived by each):
Superintendence
Mill Office and Storeroom
Machine Shop
Blacksmith Shop
Carpenter Shop

Local Transport
Railroad and Switching
Live Stock
Laboratory
Power
Heat
Water

Insurance
Fire
Liability

Taxes
Local
State

Depreciation
Buildings
Machinery
Equipment

Miscellaneous Items
Administrative Expense (Prorated over the direct producing and selling departments, according to the benefits derived by each):
Executives' Salaries
Executives' Expenses
Clerks' Salaries
Stationery and Printing
Telephone and Telegraph
Postage
Legal Expense
Miscellaneous Items

The cost of the cement at this point gives the "bin cost" of the finished product.

Sack and Shipping Expenses
Sacks
Handling
Allowances
Packing and Loading
(The cost of the cement at this point gives the "cost on board cars" of the finished product.)

Commercial Expenses
Selling Expenses:
Sales Office Salaries
Sales Office Expenses
Salesmen's Salaries
Salesmen's Expenses
Advertising
Commissions
Association Dues
Pro rata share of administrative expense

Revenue Accounts

Income	Expenses
Sales by Classes	
Interest Received	Interest Paid
Discount on Purchases	
Unclaimed Sacks	Interest Allowed
Foreign Sacks Unclaimed	
Miscellaneous Income	Discount on Sales
Legal Expense	
Miscellaneous Items	Bad Debts

A Perfect Safety Record

(*Continued from Page* 50)

Stone Mine Department

Any report on the safety activities at our plant would not be complete without a word or two regarding our mine department. Our stone is obtained in a shaft mine 560 ft. below the surface and this department employs in the neighborhood of 60 men. The light is all artificial and safeguards can only be installed in comparatively few places, such as on loading machines and locomotives. The record made in this department proves what we have said regarding the importance of education, for it is only by means of constant watching and thinking that accidents have been eliminated.

Another thing of which we are proud is that this shaft was lined with concrete from top to bottom this winter without an accident. This was a most hazardous undertaking and would have to be seen to be appreciated.

In conclusion, we might say that the record we have made was not due to any elaborate program carried on at our plant. The methods we use are similar to those used in most plants and the 924 days we have gone without a lost-time accident only serve as an inspiration for even greater accident-prevention effort in the future.

Aspects of Slurry Filtration

(*Continued from Page* 48)

If the additional production can be sold at the same profit per barrel as that made on present sales, the annual savings shown above are just as real as those previously given, and should be added to them. This would give:

Production, bbl.....	425,000	510,000	566,666
Operating profit	$11,500	$66,600	$103,500
Reduction in overhead..		$12,750	$21,250
Total annual profit.....	$11,500	$79,350	$124,750

A similar calculation, carried out with actual cost and operating figures of mills considering the use of filters, will show that practically every wet process plant should use them, and that they will return a very handsome profit on the investment, which will be repaid out of earnings in a surprisingly short time.

Crushed-Stone Plant Supplements In Road Construction

(*Continued from Page* 40)

whence it was taken by an elevator to the screen. Other trucks, mostly horse-drawn, took the stone from the bins to the job. Power for the crushing and screening was supplied by a Birdsall portable steam engine, housed under a temporary shed.

It is interesting how, in a temporary set-up such as this, the usual individual electrical motors which are used commonly in a permanent installation can be replaced by a steam or a gasoline engine, the steam engine in particular requiring constant attendance which would not be the case with electric drive. Of course, under the circumstances existing in this case, there was no alternative. The arrangements described prove wholly satisfactory and adequate.

Large Deposit of Travertine Is Now Being Worked In Mono County, California

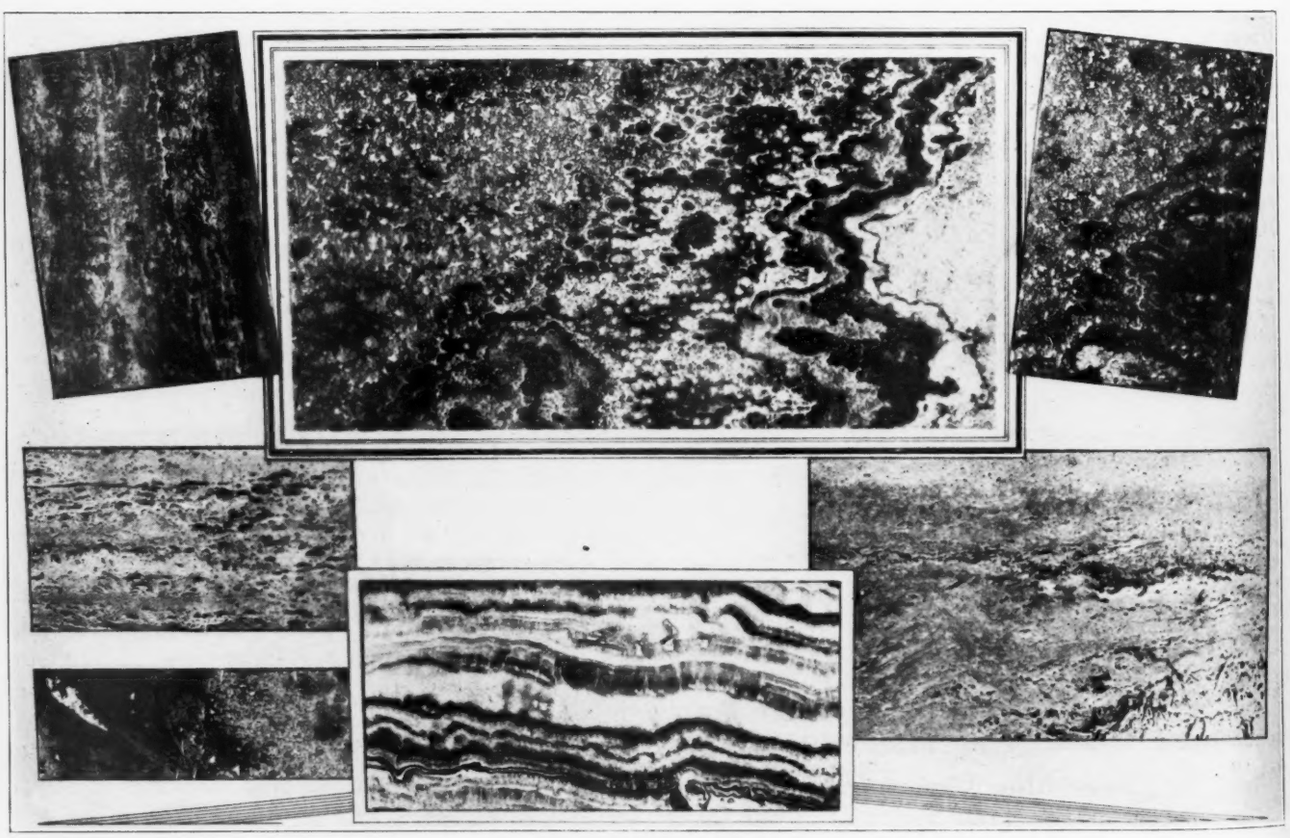
The Stone, Varying in Color from White to Red, Brown and Mauve, Lies Exposed and Accessible

THE ROMANS referred to travertine as "the stone eternal." The Coliseum at Rome and many other notable Roman buildings were constructed of travertine, and, although the finest Carrara marbles were available, the Romans and Italians found the fine texture and design of Roman travertine especially suited to their highly artistic structures, and for many centuries the world depended upon Italy for its supply of this stone. A few years ago a deposit of travertine was discovered in Colorado. This travertine, though somewhat darker, more mottled in appearance, and of less even texture than Roman travertine, has been generously used. The stone from these two deposits has been, with minor exceptions, the only travertine available for building purposes in America.

In 1854 miners prospecting for gold found a deposit of stone in Mono County, California, which they described as moss agate but, later, engineers operating under the direction of the Geological Survey entered it on the geological map as marble.

At the time of the construction of the fine old San Francisco City Hall, destroyed by earthquake and fire in 1906, all available woods and deposits of stone in California suitable for interior finish were examined, and the deposit in Mono County, then classed as marble, proved so beautiful and unique that its material was specified. Approximately sixty tons of this mineral was quarried and transported by ox teams over almost impassable mountain roads to the nearest railway point and from there shipped to San Francisco, where it was cut and polished and, with burr redwoods and other California woods, used in the interior finish of that building. After the fire which followed the earthquake in 1906, it was observed that this stone withstood the fire much better than other stones used in the building, and its ability to withstand high temperature was freely commented upon.

In 1927 a careful examination was made of the deposit from which this stone was quarried, and

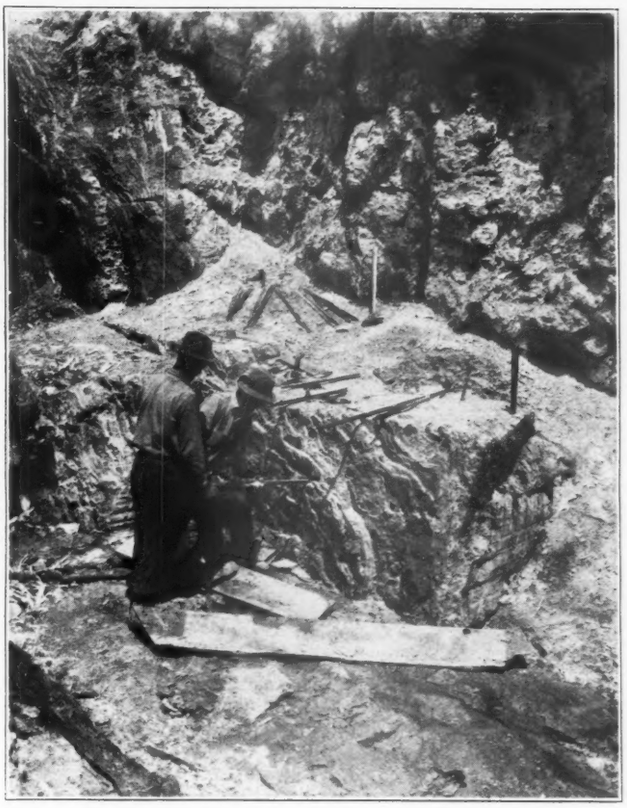


California travertine. Top, left: Ivory antique. Top, center: Opalescent. Top, right: Clouded brown. Left, center: Ivory Roman. Bottom, left: Clouded pink. Bottom, center: Veined opalescent. Bottom, right: Light taupe and brown antique.

it was found that the deposit was not marble but travertine, of such quality and texture, and in such colors and designs that, on casual observation, it might be classed as anything other than travertine. But travertine it was, and the hot mineral springs from which the deposit was formed were still at work depositing stone. Some pieces of rough, hand-sawed lumber, cut by the early prospectors and used to convey the hot water to pits for bathing purposes, had become coated and embedded in the deposit.

Some of the stone in the deposit varies from clear white of the same texture and quality as the best Roman travertine to gray, cream, and pale yellow. In other parts of the deposit the stone is practically free of voids and shows a clouded effect ranging from white, through several shades of pale yellow, to mauve. In other sections the ascending waters have passed through a deposit of metallic oxides, iron chromium and titanium and have carried these oxides to the surface with calcium carbonate and silica, and laid down the stone in beautifully banded and mottled designs ranging from translucent pale yellow to orange, pale pink to red, and in opaque shades from pale red to chocolate brown, with occasional dense streaks showing but few voids. The design in the stone has been determined by deposits of soluble alkali, afterwards replaced by the insoluble stone, and by lichens which have grown along the border of spring pools and which have been replaced in stone by the waters carrying calcium carbonate, silica, and the mineral coloring matters. Much of the stone shows such designs as have heretofore been found only in opalized wood, onyx, and agate. The accompanying illustrations in black and white give an inadequate impression of the color and texture of this stone, much of which may be justly classified as of gem-like quality.

View Showing Face of Red Travertine



Quarrying Red Travertine

The stone, when first taken from the ground, saws freely and takes a high polish, but after exposure, it acquires a hardness somewhat greater than that of marble. Much of the highly-colored stone is flecked with flakes of pure white, giving it a depth not found in colored marbles. And, unlike onyx, the stone is hard and dense and retains its polish indefinitely. Much of the solid color, white, and ivory-toned stone cannot be distinguished from the better grades of Roman travertine. The highly-colored stone is more dense and somewhat harder than Roman travertine and is recognized as travertine only by its composition and structure.

The deposit, extending to a height of 300 ft. above the floor of the adjacent valley, is now in course of development with modern equipment. The deposit is extensive and so located that quarrying is not difficult, as the stone is exposed and accessible.

The property, which comprises 240 acres, has been acquired by the California Red Travertine Company and is now in course of development under the direction of Walter Gordon Clark, a consulting engineer of New York. The quarry is

located near the town of Bridgeport, on the main highway to Lake Tahoe, in that part of the Sierra Nevada Range commonly known in California as the "High Sierras."

Modern appliances, including six air compressors, Ingersoll-Rand quarry bars, jackhammers and milling equipment, have been installed. There are three boom derricks and about ¾ mi. of mining track. A Sturtevant rock crusher, capable of turning out 25 or more tons of terrazzo material daily, is in operation. Transportation facilities have been provided and the company is now shipping and marketing travertine and terrazzo material, fine medium and coarse, in all the colors mentioned. The present daily capacity of the plant is 60 tons of travertine and 20 tons of terrazzo material.

Shipments are made principally by motor truck to Hudson, Nevada, then via the Copper Belt Railroad to the Southern Pacific and thence to destination, and occasionally by motor truck from the quarry to Los Angeles. Connection with the Virginia and Truckee Railroad can be made at Minden, Nevada.

Officials of the company include Mr. Clark, president and managing director; D. E. Sullivan, secretary; E. H. Marsh, treasurer and assistant secretary; J. G. Conway, assistant treasurer and superintendent. Company headquarters are maintained at 318 West Ninth Street, Los Angeles.

International Show Will Be Held in Chile

According to an announcement of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, an International Railroad, Road and Touring Exposition will be held at Santiago, Chile, from December 10 to 31, 1929. The third South American Congress of Railways will be meeting there at the same time. The Chilean government has invited American makers of all classes of machines, materials and equipment concerning railroads, roads, tourist travel, automobiles, trucks and tractors to exhibit at the exposition. Each application for permission to participate should be sent to the secretary (Exposicion Internacional de Ferrocarriles y Caminos), San Martin 352, Santiago, Chile, accompanied by a deposit of 50 pesos ($6.05). Space in covered buildings will be charged for at the rate of 25 pesos ($3.025) per square meter and that in the open at the rate of 10 pesos ($1.21). Entries of foreign merchandise will be made under a 6-month's free license, the customs charges being cancelled if the merchandise is re-exported. Railway freight charges will be reduced 50 per cent. Additional information concerning this exposition and its scope can be had by application to the Automotive Division of the Bureau of Foreign and Domestic Commerce or any of its district offices.

Quarrying Roman-type Travertine.

New Slag Plant of Woodstock Slag Corporation Has Central Mixing Plant in Connection

Together With Older Plant They Supply Material In Large Territory to Fill Any Need

By W. E. TRAUFFER

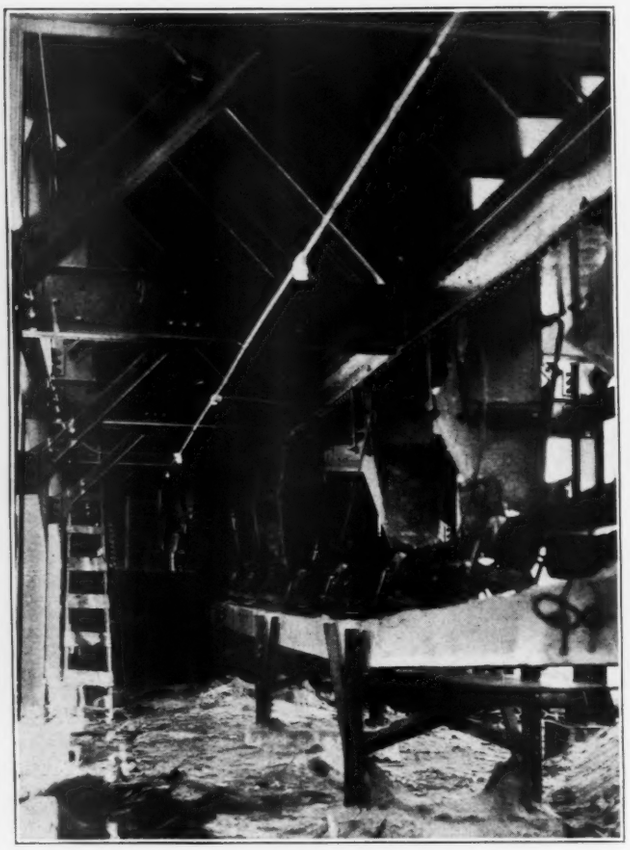
THE Woodstock Slag Corporation of Birmingham, Alabama, operates two slag plants which are ideally located and designed for the production and distribution of slag by truck to local consumers and by rail to more distant points. A ready-mixed concrete plant operated in connection with the newer of the two slag plants is of the most modern design and is equipped to produce a uniformly high grade of concrete.

The New Vanderbilt Plant

The Vanderbilt plant of the Woodstock Slag Corporation is located at 39th Street and 14th Avenue adjacent to the Vanderbilt plant of the Woodward Iron Company. The present operations are on the site of the old plant which began operations in 1922. In 1928 all of the original equipment was scrapped and a new slag and ready-mixed concrete plant was built, only a row of wooden bins which were erected a few years ago being spared. The capacity of the slag plant is about 50 tons per hour, while the central mixing plant, which has been in operation less than four

Steam Shovel Which Loads Slag from Bank at Vanderbilt Plant. Note Thin Laminations of Slag Which Cause it to Break Into Small Fragments When Excavated

Slag Plant at Vanderbilt from Top of Concrete Mixing Plant. Slag Screening and Storage Plant at Left, Sand Bins and Car Discharging Slag Into Crusher Hopper in Center, Crane at Right Stockpiling Sand. Vanderbilt Plant of Woodward Iron Company in Background



Main Conveyor Under Sand Bins Which Feeds Materials to Concrete Mixing Plant

months, has a capacity of 1,000 cubic yards of concrete per 10-hour day.

Excavating and Crushing the Slag

The slag, after it is drawn from the furnaces, is poured in layers on a bank which does not exceed 15 feet in height. These layers cause the slag, when excavated, to break up into small pieces, reducing the amount of crushing necessary. A Marion 1 yd. caterpillar steam shovel loads into railroad bottom-dump cars which are hauled to the plant by a Baldwin 45-ton locomotive.

The cars are hauled up an incline at the plant onto a steel trestle where they discharge into a 40-ton capacity steel hopper under the track. The hopper discharges onto a Jeffrey pan conveyor which feeds a Montgomery 3-ft. by 5-ft. single deck vibrating screen with 1½-in. round perforations. A Dings magnetic pulley on the head end of the conveyor removes any iron present in the slag and discharges it onto a platform underneath the conveyor. This iron, which runs about 1 ton in every 500 tons of slag, is shoveled into cars by hand and sent back to the iron company to be used over. The pan conveyor is driven through a Foote speed reducer and a Chas. Bond Company flexible coupling.

The oversize from the vibrating screen goes to a Telsmith No. 3-F reduction crusher which discharges into a Jeffrey elevator on 48-ft. centers to the screening building. The material passing through the screen goes directly to this elevator. The crusher is belt-driven by a 40-hp. motor and the elevator is driven at its head pulley by a 25-hp. motor through a Jones speed reducer.

Screening and Storage

The screen building is a new steel structure resting on the wooden bins previously mentioned.

Vanderbilt Plant from the Southwest. The Slag Plant Is at the Left with Concrete Plant at Right. Note Cement Storage Building and Enclosed Conveyor to Mixers

The elevator discharges into a split chute feeding two Hum-mer 4-ft. by 5-ft. double deck vibrating screens which separate into 3 sizes of material. A third Hum-mer single deck vibrating screen gets the oversize from these. The material passing through this screen drops onto a belt conveyor and the oversize goes directly to a bin. By changing the screen cloths, any of 9 sizes can be produced as desired. Chutes under the screens feed the sized material direct to bins while other chutes feed two 16-in. horizontal belt conveyors which discharge into two bins at the end nearest the slag plant for concrete slag. One of these conveyors is on 65-ft. centers and has Boston Woven Hose and Rubber Company "Silver King" belting. The other is 80 ft. long and has Goodyear "Longlife" belting. Both are driven by the same 5-hp. motor through a Jones speed reducer. The wooden slag bins have a total capacity of 800 tons and discharge into trucks or railroad cars on a siding adjacent to the bins through 12 gates.

Concrete Sand

Sand is shipped in to the plant from the Montgomery and Selma districts in bottom-dump cars. These are run onto the same steel trestle as the slag cars and discharged into four steel bins with a total capacity of 287 tons. These bins discharge through 6 gates onto a 20-in. belt conveyor underneath which carries the materials to the top of the concrete plant. Slag from the two concrete slag bins discharges through a 20-in. cross conveyor on 32-ft. centers onto the same conveyor to the concrete plant. The cross conveyor is driven by a 5-hp. motor through a Jones speed reducer and has Goodyear belting. The main conveyor runs horizontally under the sand bins and then on an incline

Two-yard Mixer Discharging Into Trucks. Note Enclosed Conveyor from Cement Storage House Above

Top of Screening Plant at Vanderbilt Showing Final Vibrating Screen. Elevator from Crusher at Right, Conveyor to Storage Bins in Foreground

Pan Conveyor with Magnetic Pulley Driven by Speed Reducer at Right Feeding Slag Onto Vibrating Screen at Vanderbilt Plant

to the concrete plant. It is on 230-ft. centers and is driven at the head pulley by a 15-hp. motor through a Jones spur gear speed reducer. This conveyor also has Goodyear belting.

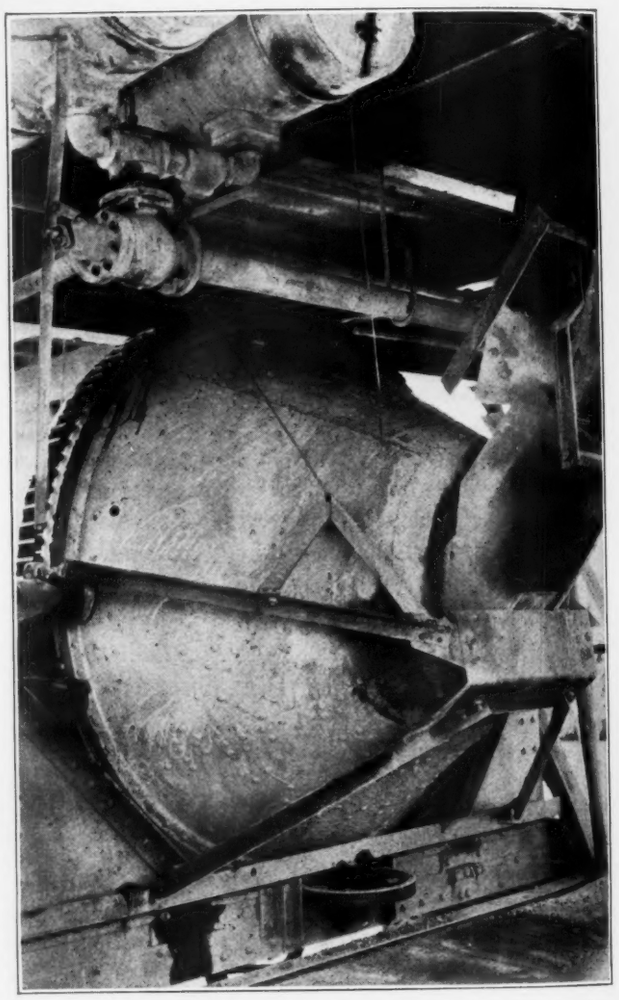
A sidetrack running alongside the sand bins is used for stockpiling additional sand. An Orton and Steinbrenner gasoline driven caterpillar crane with a 1 cu. yd. Williams clamshell bucket unloads the sand from cars into stockpiles. It also rehandles the sand into the bins when desired. This emergency storage of sand saved the plant from a possible shut-down last spring when the floods in Southern Alabama temporarily shut off the supply from Montgomery and Selma.

The Concrete Mixing Plant

The main conveyor discharges into any of four steel bins at the top of the concrete plant, two for slag and two for sand, with a total capacity of 270 cubic yards. There were originally three bins but a partition was installed in one of these. A special Blaw-Knox 3-way gate with a hand-operated selective ratchet control feeds the material to the batcher. The auxiliary bin feeds through a chute into the same batcher.

The Blaw-Knox 8,000-lb. capacity weighing batcher is equipped with a Standard scale having a dial on which the last 200 lbs. register. It discharges through a 2-way hopper into either of the two mixers on the floor below. These are Smith mixers of the tilting type, one a 2-cu. yd. Type 56-S, the other a 1-cu. yd. Type 28-S. These are direct gear driven by a 40-hp. and 20-hp. motor respectively. Mixing water comes from three Smith 42-gal. water tanks, one for the small mixer and two for the large. Each mixer is equipped with a Koehring "Batchmeter" which automatically controls the time of mix. The chutes feeding these mixers are supported on a steel framework which raises them when the mixer is tilted. This arrangement was designed by an employe of the company and is clearly illustrated in one of the accompanying photographs. A Bull-Dog master safety switch on the mixer platform controls the entire plant.

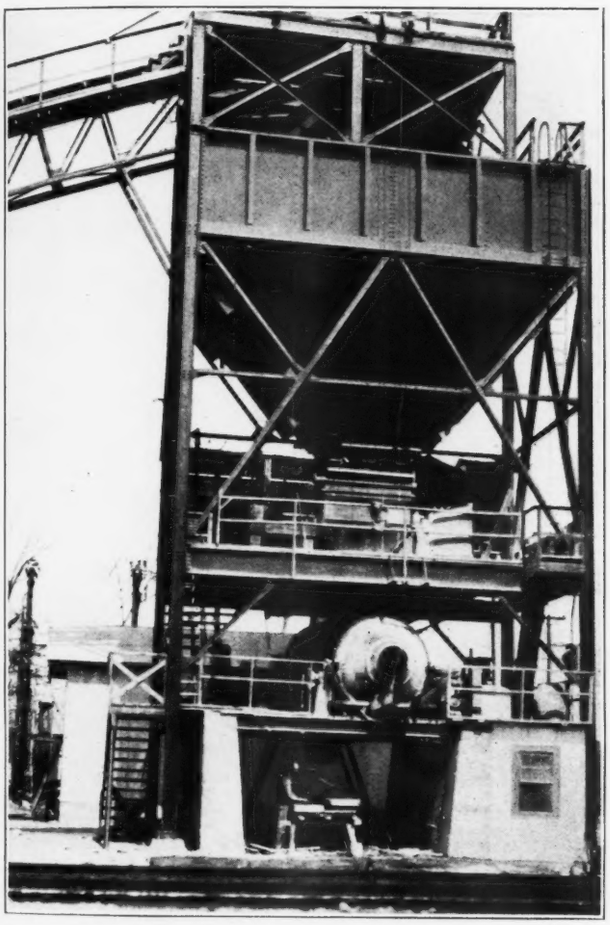
Duplicate Double-deck Vibrating Screens in Vanderbilt Plant



Two-yard Mixer in Concrete Plant with Water-measuring Tanks Above. Note Special Attachment Which Automatically Raises Chute as Mixer Is Tilted

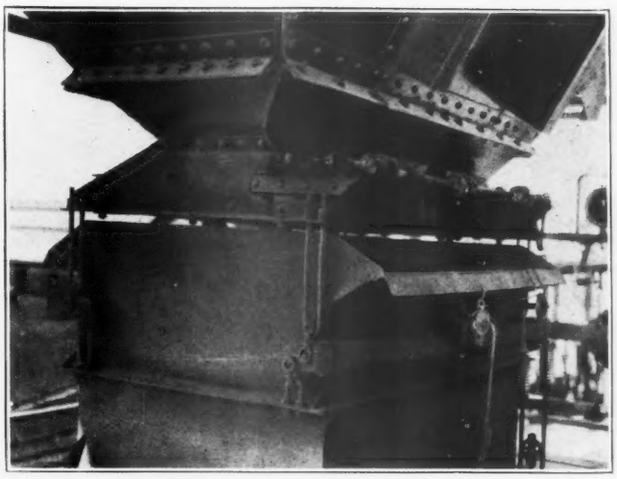
Cement is stored in sacks in a cement storage house adjoining the mixing plant. This building has concrete foundations and wood framework covered with corrugated sheathing. It has a capacity of about 1,000 bbls. of cement and is joined to the mixing plant by a bridge. A Jeffrey barrel elevator running through this bridge conveys the cement sacks to the mixing platform. This elevator is driven by a 5-hp. motor through a Palmer-Bee mill type speed reducer. The empty cement sacks are dropped through a chute to the ground floor where they are cleaned by a Northern Conveyor Company bag cleaner.

The slag produced at this plant weighs only about 80 lb. per cu. ft. and is ideal for concrete aggregate. The concrete from the central mixing plant testifies to the quality of the slag as the strengths at 28 days average between 20 and 30 per cent over the designed strength. An inspector from a testing laboratory of high standing is on the job at all times and certifies every batch of concrete produced.



Concrete Plant from Southwest Showing 1-yd. Mixer. Sack Cleaner Is in Enclosure at Right

All buildings of the new slag and concrete plant, except the cement storehouse and the office, are of structural steel with corrugated metal siding and roofing. All foundations are of concrete. All construction and erection work was done by the company with the exception of the weighing batchers, mixers and water tank. All steel and bins were furnished by the Ingalls Iron Works and all of the conveyors by the Variety Iron Works. The conveyor rollers are Timken bearing equipped. The corrugated siding was furnished by the Tennessee Coal, Iron and Railroad Company. All of the conveyor belts have Crescent belt couplings.



Weighing Batcher in Concrete Plant with Scale at Extreme Right. Note Selective Ratchet Control of the Three Aggregate Bins

The location of the plant is ideal for both local and railroad distribution, being about 2½ miles northeast of the heart of Birmingham. This allows truck distribution of the slag and concrete to the sections where the most construction work is being done. The Southern Railway's industrial tracks run by the plant and there are also connections to the L. and N. and Central of Georgia railroads. About 75 per cent of the slag produced is shipped by truck for local use.

The Slag Plant at Woodward

The Woodward plant of the Woodstock Slag Corporation adjoins the plant of the Woodward Iron Company near Fairfield from which its slag is procured. It is about 17 miles southwest of Birming-

Pouring Molten Slag Into Cooling Pits at Bessemer. Shovel at Left Excavating from Another Pit

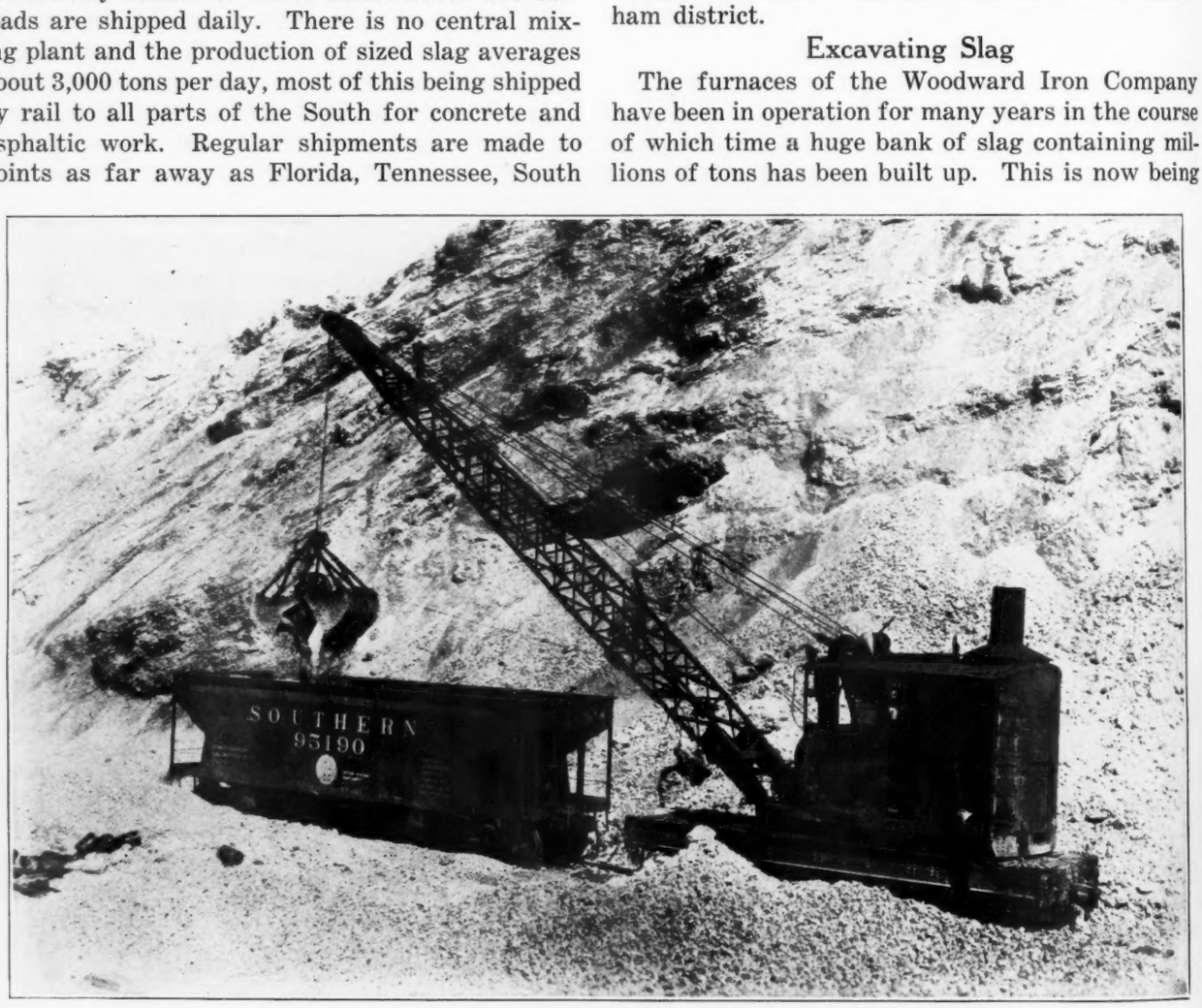
Eccentric Feeder to Primary Crusher at Bessemer Plant

Looking Down from Top of Slag Bank at Bessemer. Steam Shovel Loading Slag in Foreground and Locomotive Crane in Background

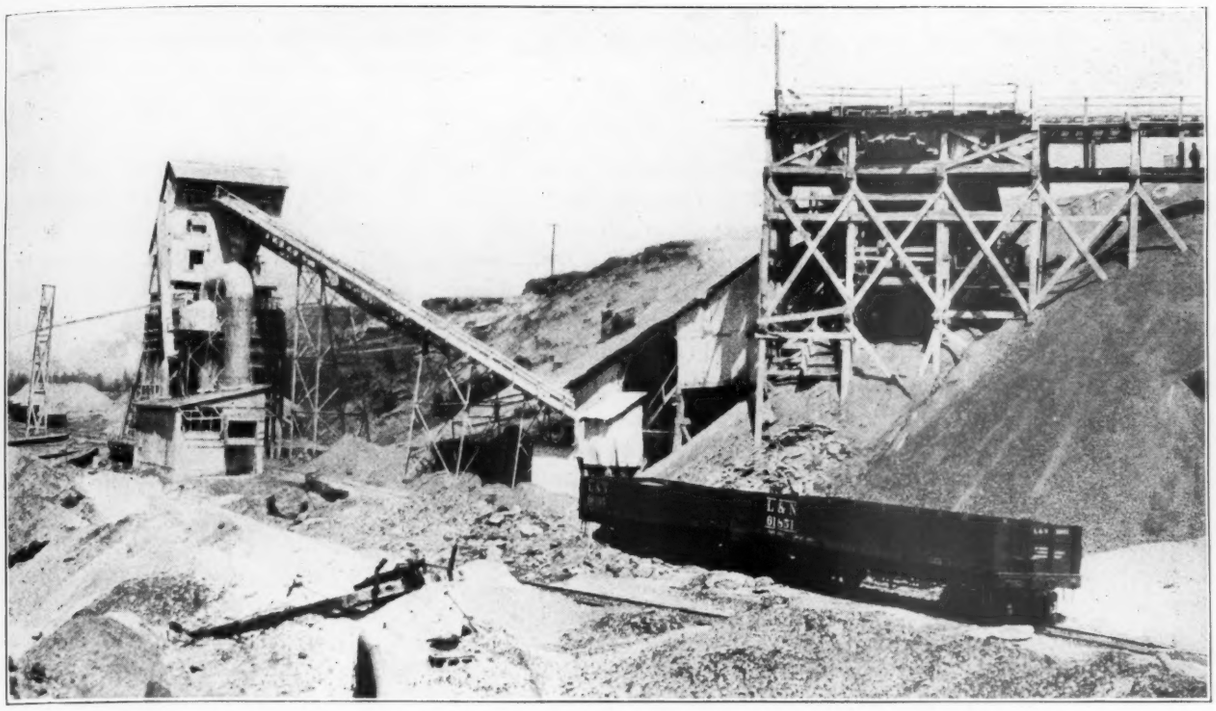
ham between Bessemer and Fairfield. Production here consists of commercial slag and pit-run slag for railway ballast of which latter about 100 carloads are shipped daily. There is no central mixing plant and the production of sized slag averages about 3,000 tons per day, most of this being shipped by rail to all parts of the South for concrete and asphaltic work. Regular shipments are made to points as far away as Florida, Tennessee, South Carolina and the Mississippi river. Shipments can be made over any railroad entering the Birmingham district.

Excavating Slag

The furnaces of the Woodward Iron Company have been in operation for many years in the course of which time a huge bank of slag containing millions of tons has been built up. This is now being



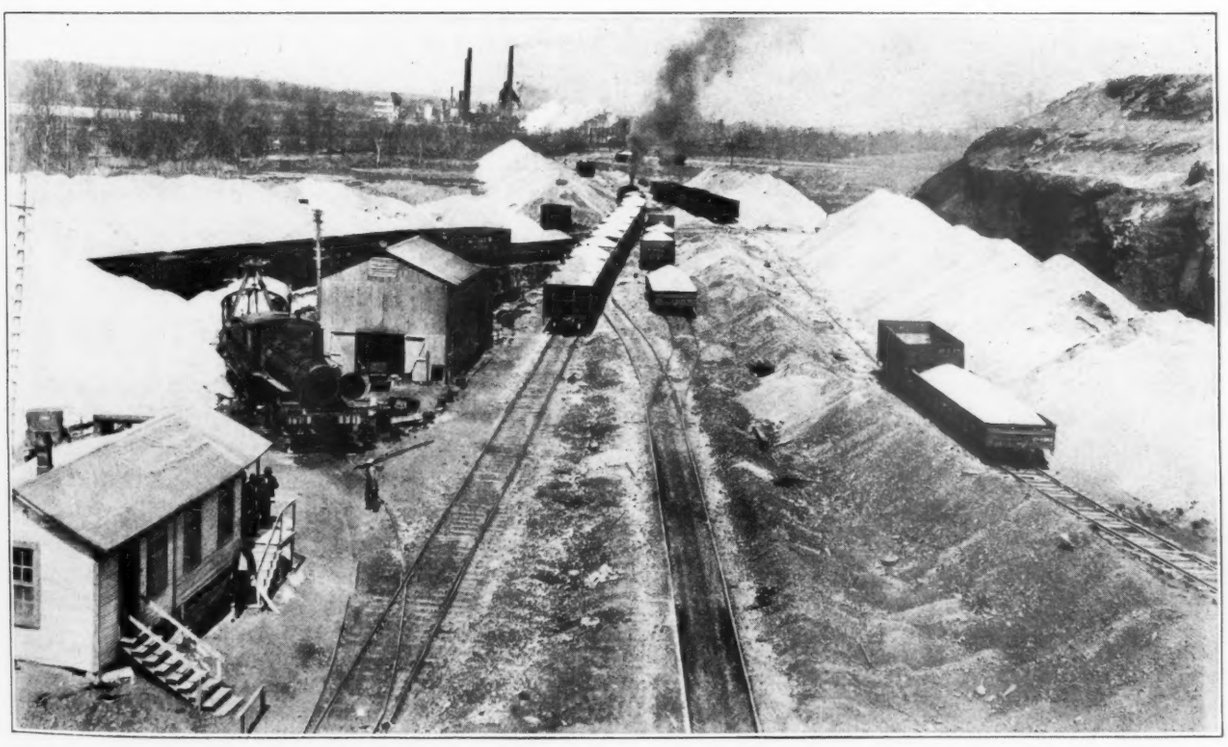
Locomotive Crane at Foot of Bank Loading Pit-run Slag Into Cars for Shipment at Bessemer Plant



Slag Plant at Bessemer. Screening and Storage Building at Left, Crusher House, Slag Bank, And Trestle Over Crusher Feed Hopper at Right

excavated and shipped as ballast. Cars on a siding along the foot of the bank are loaded by a Marion 60 railroad type steam shovel with a 2-yd. dipper and an Ohio locomotive crane with a 2-yd. Hayward clamshell bucket. Some blasting is necessary to break down the face which averages over 70 feet in height. Drilling is done with 7/8-in. hand drills and DuPont and Hercules 40 per cent dynamite are used for blasting.

Several long pits about 40 feet wide and 20 feet deep have been dug into the top of the slag bank. Molten slag is hauled from the furnaces and dumped into these pits to cool. The pits are of sufficient capacity to allow an adequate period of time before the slag is excavated. Two Bucyrus Type 70 railroad steam shovels with 2½-yd. dippers excavate the slag from the pits into railroad bottom-dump cars. These are hauled onto a



Office and Repair Shop in Foreground, Storage Piles at Left and Trainload of Slag Being Switched for Shipment

wooden trestle at the edge of the bank near the slag plant and discharged into a steel-lined hopper in the crusher building.

Crushing Operations

The hopper feeds by means of a Montgomery Coal Washer Company eccentric feeder into the Telsmith 48-in. primary crusher. The crusher is belt-driven by a 75-hp. Westinghouse motor which also drives the feeder. The crusher discharges onto a 36-in. belt conveyor on 20-ft. centers which feeds an Allis-Chalmers 5-ft. by 20-ft. revolving screen with 1½ in. perforations. The conveyor has a Magnetic Manufacturing Company magnetic pulley to remove all iron and is driven by a 5-hp. motor. The screen is belt-driven by a 15-hp. motor. The over-size from the screen goes to two secondary crushers. One of these is a Symons 36-in. cone crusher belt-driven by a 50-hp. motor. The other is a Kennedy-Van Saun gearless direct drive crusher driven by a 30-hp. motor. Both discharge, along with the slag passing through the screen, onto a 36-in. inclined belt conveyor on 210-ft. centers to the top of the screening building. This conveyor is driven at its head end by a 30-hp. motor through a Jones speed reducer. All belt conveyors are of Stearns make and the belting was furnished by the Manhattan Rubber Company and the Boston Woven Hose and Rubber Company, being in two sections.

Screening and Storage

The main conveyor discharges through a split chute to a battery of four Hum-mer 4-ft. by 5-ft. single deck vibrating screens operating in pairs. The first screens in each pair have ¼-in. and ⅝-in. mesh wire cloth respectively while both of the second screens have ¾-in. mesh. The over-size from the ¾-in. screens goes to 3 more Hum-mer screens in a row with 1½-in. mesh. The material passing through the ¾-in. screens goes to a battery of 4 Hum-mer screens with ¼-in. mesh. Each of the five sizes produced goes to a separate compartment in the 600-ton capacity steel bin which also serves as a support for the screening plant. The bin discharges from the bottom into trucks or cars on a track running under the bins. The steel bins, plant superstructure, and conveyor framework, all of which are of structural steel, were furnished and erected by the Ingalls Iron Works. Fairbanks Track Scales are installed under these bins and all shipments weighed by a sworn weighmaster under the supervision of the Southern Weighing and Inspection Bureau.

Shipping and General Information

A small percentage of the distribution is by truck for local construction work. Five locomotives are operated. An American 55-ton locomotive hauls loaded cars from the plant to the railroad main line. Four smaller locomotives, a 30-ton, a 50-ton and two 45-ton, haul slag from the pits to the crusher and from the bank to the yards. The plant is protected against fire by Pyrene and Guardene fire extinguishers.

A complete blacksmith and machine shop is maintained. The equipment includes a Lodge and Shipley 16-in. engine lathe, a Cincinnati Machine Tool Company drill press, a William Gleason 36-in. engine lathe, a Gould and Eberhardts 20-in. shaver, and an Acme bolt cutter, all of which are belt-driven from the same 15-hp. motor. There is also a forge, air for which is furnished by a Champion No. 5 30-in. blower. A Chicago Pneumatic 7½-in. by 6-in. air compressor is belt-driven by a 15-hp. motor. A small electric-driven emery wheel and a complete set of miscellaneous tools complete the equipment.

Miscellaneous

The main office of the Woodstock Slag Corporation is in the Southern Railway Building in Birmingham. George A. Mattison is president, George A. Mattison, Jr. is vice-president and general manager and J. H. Worrell is secretary. C. N. Lanier is general superintendent, J. A. Jennings is superintendent of the Woodward plant and M. W. Findley of the Vanderbilt plant.

Industrial Leaders to Direct National Standardization Activities

A far-reaching development in national industrial standardization activities had its inception July 9, when railroad and utility presidents and other first line executives representing nine of the nation's greatest industries met at the headquarters of the American Standards Association in New York to take over from scientists and engineers the reins of direction of the national standardization movement. James A. Farrel is president of the United States Steel Corporation and, since 1925, chairman of the Advisory Committee of the American Standards Association. This occasion was the organization meeting of the first board of directors of the American Standards Association.

The Board of Directors includes Matthew S. Sloan, president of the New York Edison and affiliated electric companies; L. A. Downs, president of the Illinois Central Railroad; Bancroft Gherardi, vice-president of the American Telephone and Telegraph Company; F. E. Moskovics, president of the improved Products Corporation; Quincy Bent, vice-president of the Bethlehem Steel Company; Howard Coonley, president of the Walworth Company; R. J. Sullivan, vice-president of the Travelers Insurance Company; C. L. Collins, president of the Reliance Electric and Engineering Company; and George K. Burgess, of the Bureau of Standards.

Rolled Slag and Traffic-Bound Roads

THE National Slag Association of Cleveland, Ohio, has published Symposium No. 15 of a series describing the characteristics and uses of blast furnace slag. This symposium, entitled "Rolled Slag and Traffic-Bound Roads," describes the use of slag in roads constituted principally by rolling the material into place with no addition of cementing materials other than water. Abstracts from this symposium are quoted.

Waterbound Slag Macadam Surfaces

John H. Bateman, Professor of Highway Engineering, Louisiana State University, in a book "Highway Engineering," published in 1928, states two theories regarding the construction of waterbound macadam roads. The first is that the stability of this type of road is due to the cementing characteristics of the fine filler used, and second, that the stability is due to the interlocking of the large particles, disregarding the action of the filler. He also states that "Roads have been successfully constructed by both methods. Broken quarry rock is most commonly used in the construction of macadam roads. Field stone and blast furnace slag have been used to a limited extent."

J. W. Payne, Civil City Engineer, Akron, Ohio, is quoted in the booklet "Why Not Use Slag?" published by the Illinois Improvement and Ballast Company in 1905. He stated that "We have used slag as a foundation for brick and block asphalt paving for 16 years. It has given us better satisfaction than concrete. We also use it for roadbase in macadam roads. The slag is broken up into uniform sized pieces, and rolled dry with a heavy roller, then sand or gravel is spread over it to a depth of one-half inch or an inch and thoroughly washed in with a hose, and rolled again while wet."

A. M. Thackara, U. S. Consul-General, Berlin, Germany, in his "Daily Consular and Trade Reports" of February 10, 1914 makes the following statement, "The usual practice in Germany is to use slag for roadmaking, the road being constructed after the system of Macadam, the slag supply replacing the usual crushed stone. As in all cases where it is used in solid form, slag is employed for roadmaking only in regions near the place of its production. Slag roads are most frequent in northwestern Germany, a region which is in proximity to an iron-making district."

Waterbound Slag As Base for New Construction

It is often found economical to use an old waterbound slag macadam road, which has outlived its usefulness as such, as a base on which to lay concrete, brick, or some form of bituminous construction. George C. Warren, president, Warren Brothers Company, states that "Where macadam roads exist, whether of stone, gravel or slag, they form a basis for the economic salvaging of past expenditures in reconstruction to meet modern conditions."

Slag-Clay Road Construction

The State of Delaware has conducted recent experiments with roadside material such as clay used instead of water as a binding agent in waterbound macadam road construction. Samuel Knopf, Principal Assistant Engineer, Delaware Highway Department, in an article "Concrete Mixer Speeds Construction," published in *Engineering News Record*, May 26, 1927 describes the procedure followed.

Waterbound Slag Macadam Base

Slag, when first introduced as a macadam material, was used largely for base courses. Maury Nicholson, city engineer, Birmingham, Alabama, is quoted in a booklet published by the Birmingham Slag Company, in 1914, as follows: "The city of Birmingham (Ala.) has used slag exclusively for the past 14 years as the aggregate in concrete pavement foundations, and for a base in slag and chert macadam."

E. N. Seymour, an engineer of the Georgia Highway Commission in a paper "Gravel and Stone Bases for Asphalt Wearing Courses" presented at the 1927 Asphalt Paving Conference and published in *Pit and Quarry*, December 7, 1927 is also quoted. He says, "On the Georgia Highway system we have completed 214.08 miles of various types of asphalt surfacing on stone and slag base, and have projects under construction totalling 7.11 miles on stone and slag base. Under our specifications we allow the use of slag where stone is specified, therefore the total mileage is shown as one type."

Traffic-Bound Slag Roads

In some parts of the country, for unimportant roads, slag has been spread on the subgrade, levelled off, and left in that condition, to be compacted as time went on by the traffic passing over it. In this manner a very fair road is obtained at slight cost, which forms a base for a better type of pavement when heavier traffic demands it, or when sufficient funds are available.

Raymond H. Smith, assistant maintenance engineer, Ohio Department of Highways in an article "Rapid Development of Ohio Roads," published in Highway Topics, January, 1927, makes the following statement: "Traffic-bound gravel, stone or slag surface is constructed in order to serve traffic until a higher type of pavement is justified by traffic."

Granulated Slag Roads

Many roads have also been built in the vicinity of steel plants with granulated slag as the surfacing material. This form of construction furnishes a low cost road which gives good service under moderate traffic, but is not intended to take the place of higher types of road. In many localities the use of granulated slag roads has filled a decided need. If maintained in the same way as the traffic-bound roads previously described, they provide a firm, well-drained road at very low cost.

Rolled Slag Base for Brick and Block

The base for a brick or block pavement may be an artificial base of concrete, rolled slag, or bituminous-bound slag, or the natural sub-grade if suitable.

Albert C. Smith, of the Smith Engineering Company, Warren, Ohio, and formerly city engineer, in an article, "Paving Economy in Warren, Ohio," published in *Roadmaker, Excavator and Grader,* November, 1921, makes the following statement: "We favor the slag base because if thoroughly compacted it makes just as durable, firm, and substantial a foundation as I know of, is elastic under climatic changes, is cheaper than some others, takes on the cementing characteristics of so-called concrete, furnishes a means of drainage in addition to the artificial drainage behind the curbs, does not have to be reinforced with steel, is more uniform in quality and permits of extending the paving season into cooler weather because there is no danger of freezing."

Rolled Slag Sub-base Course

Slag has been used in this capacity under many types of road, where the soil condition made necessary a sub-base course of crushed material in order to insure a firm base for the construction of the pavement.

Prof. F. H. Eno, Professor of Municipal Engineering, Ohio State University, in his "Report Upon the Sub-Base Tests on Route 26, Washington County, Ohio," published in November, 1926, makes the following statements: "Slag appears to have a slight advantage over any other treatment. The porous bases show thus far much less cracking than do the natural soil and admixture of cement and soil bases."

Slag Fill

Slag is also used in fills over low-lying or marshy ground to insure a firm, well-drained base for highways. C. L. Gould, Civil Engineer, Pennsylvania Railroad, in a booklet, "Why Not Use Slag?" published by the Illinois Improvement and Ballast Company in 1905, gives a description of a fill which had been in place 16 years under unusually severe conditions.

Slag Cushion or Bedding Course.

An Engineering Commission was appointed by the National Paving Brick Manufacturers' Association in 1928 to study general paving and highway conditions with special reference to the brick road. Members of this Commission were Wm. H. Connell, consulting engineer, Philadelphia; P. J. Freeman, chief engineer, Bureau of Tests and Specifications, Allegheny County, Pennsylvania; F. J. Cellarius, consulting engineer, Dayton, Ohio; and Warren R. Neel, state highway engineer, Georgia. Their report was published in "Survey of Brick Pavement Performance," *Engineering News Record,* November 1, 1928, in which the following statement was made: "A sand or granulated slag cushion not exceeding 1 in. and preferably ¾ in. in depth has proved to be the most desirable bedding course."

John H. Bateman, in his book, "Highway Engineering," which has been previously mentioned, under the heading, "Bedding Courses," says: "Granulated slag has been used very successfully in sections of the country where it is economically available. This material possesses a natural cementing property which causes it to bind together and thereby prevent displacement."

The best indication of the suitability of slag for the rolled type of road construction is the fact that it has been specified for such use by the Highway Department of all the states where it is commercially available. At different periods it has been specified for water-bound, traffic-bound or rolled base construction on a parity with other materials in Alabama, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, Maryland, Michigan, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the U. S. Bureau of Public Roads.

Standardizing Gravel Sizes

The Board of Directors of the National Sand and Gravel Association met in Toronto, Ontario, on May 17, 1929 and voted unanimously in favor of an effort to simplify sizes of screened gravel. Recommendations along this line had already been tentatively formulated by the standardization committee of the association. With the approval of the Board of Directors, the standardization committee will proceed to circularize the entire membership of the association, also non-member firms in the industry, to secure approval of the recommended standards. When such approval has been received from firms representing at least 80 per cent of the volume of production, the standardization committee will be authorized to request the Division of Simplified Practice to call a general conference of producers, distributors and users of gravel to act upon the recommendations.

Pennsylvania-Dixie Cement Corporation Plant at Richard City, Tennessee, is Kept Modern Although One of First Plants in South

Operates Two of Largest Kilns in Existence

THE Richard City, Tennessee, plant of the Pennsylvania-Dixie Cement Corporation is located in the Sequatchie Valley of the Cumberland Mountains about ¾ mile north of the Alabama-Tennessee line and 25 miles directly west of Chattanooga. Although it is one of the oldest plants in the south, all operations have been kept up with the best modern practices. The property totals 2,500 acres of which about 1,400 acres are mountain land containing rock deposits. Distribution is over the N. C. and St. L. Ry. which is connected to the plant by a ½-mile switch track.

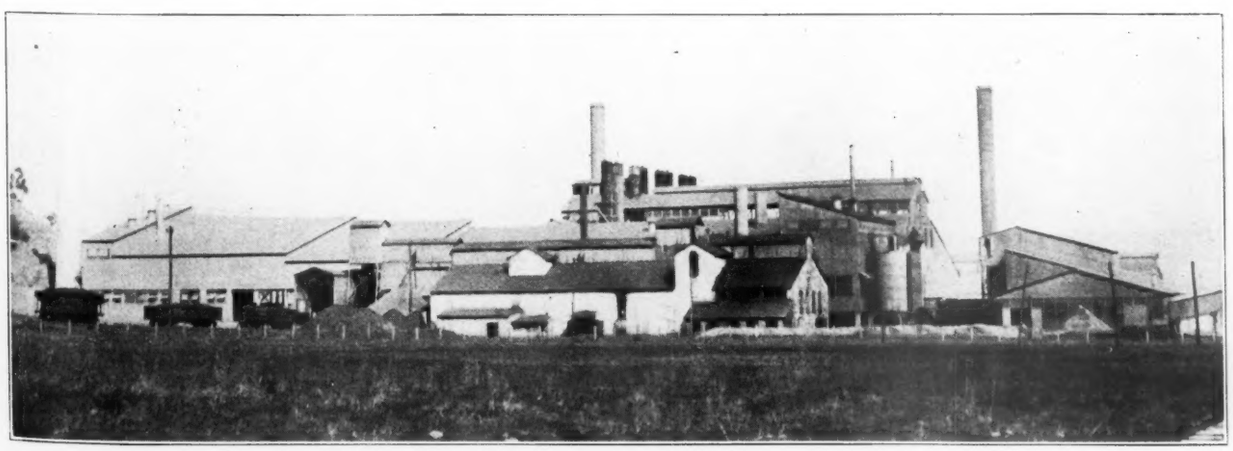
Plant Description and Recent History

The plant was taken over by the Pennsylvania-Dixie Cement Corporation on October 1, 1926 and is known as Plant No. 3. All buildings are of modern construction with concrete foundations, structural steel framework, stuccoed walls and corrugated metal roofing.

The original plant was built in 1907, but has been added to and altered until very little of the original equipment or buildings remain. Changes were made gradually without loss of production or shutting down of plant operations. All of the reconstruction was done by employes of the company with the exception of the steel erection.

The two crusher buildings, the machine shop and the office buildings were built in 1922, the raw material storage building in 1923, the raw mill building in 1925 and the kiln building in 1927 when the two new kilns were installed. The cement storage building was rebuilt in 1925. The Sly dust collecting system in the finish grinding building was installed in 1926. Previous to 1925 power was generated at the plant but since then it has been purchased from public service lines. The Fuller-Kinyon system of handling powdered coal for the kilns is also a comparatively recent installation.

BLAINE S. SMITH
President of the Pennsylvania-Dixie Cement Corporation



Plant from Southwest. Finish Grinding Building at Right

Shovel Loading Stone Into Cars. Note Huge Pile of Stone at Right Broken Up by Recent Blast. Plant in Background

The 150-ft. concrete stack was built in 1928 by the Rust Engineering Company.

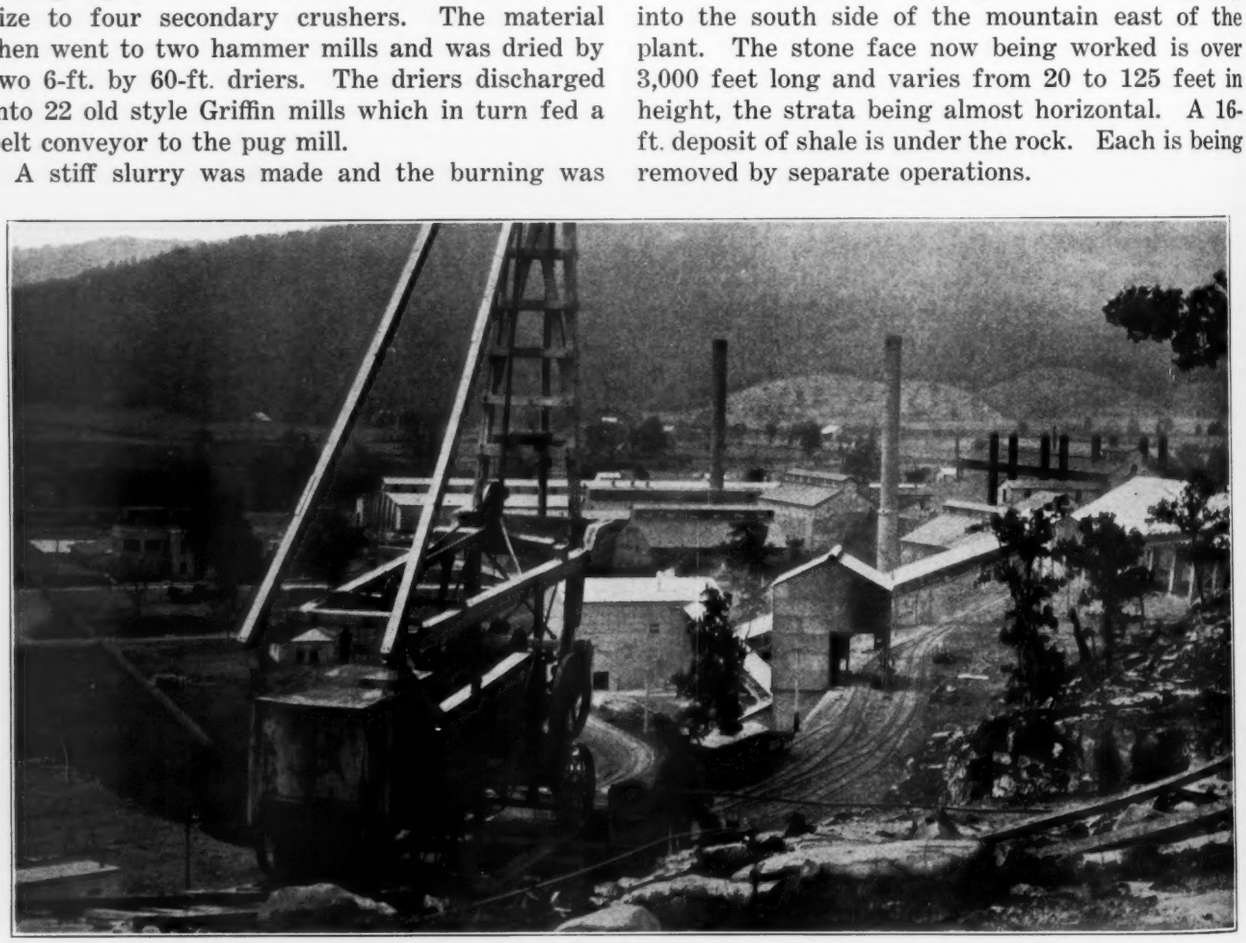
The Old Plant

The old plant was located on the side of the mountain north of the present plant and the quarry was about 500 yards up the mountain. Stone went through a primary crusher and revolving screen, fines going to the raw material storage and oversize to four secondary crushers. The material then went to two hammer mills and was dried by two 6-ft. by 60-ft. driers. The driers discharged into 22 old style Griffin mills which in turn fed a belt conveyor to the pug mill.

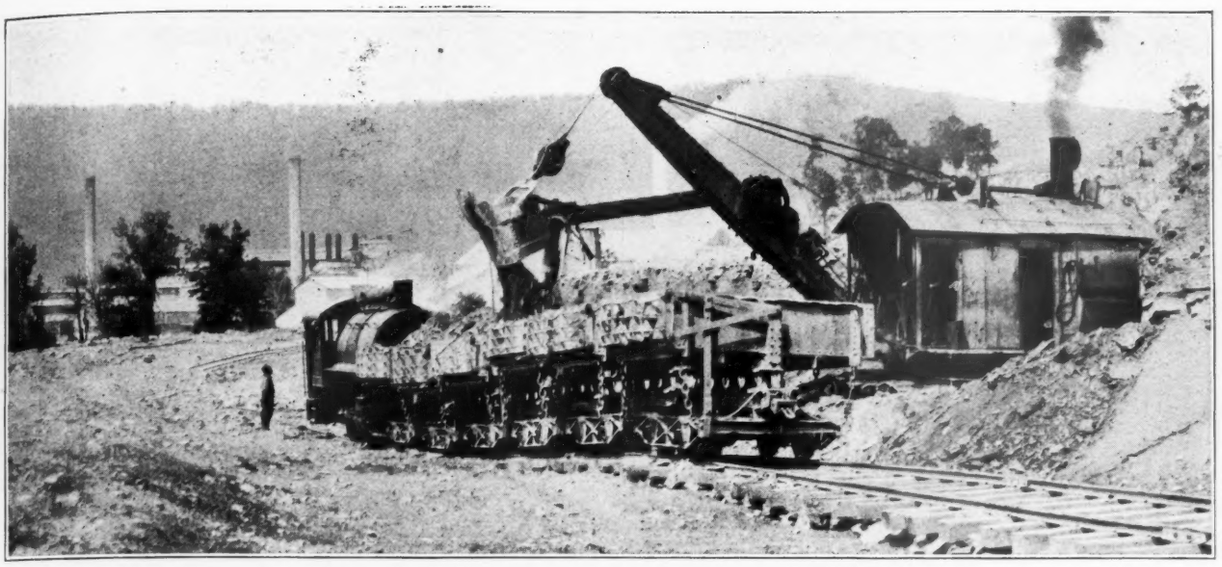
A stiff slurry was made and the burning was done by ten 8-ft. by 110-ft. kilns. The clinker was cooled in four 6-ft. by 60-ft. rotary coolers and the finish grinding done with practically the same equipment now in use with a few additions and alterations.

Quarrying Operations

The limestone and shale quarries are being dug into the south side of the mountain east of the plant. The stone face now being worked is over 3,000 feet long and varies from 20 to 125 feet in height, the strata being almost horizontal. A 16-ft. deposit of shale is under the rock. Each is being removed by separate operations.



View of Plant from Hillside Above Quarry. Primary and Secondary Crusher Building in Foreground With Raw Material Storage Building at Right. Office Building at Left. In Immediate Foreground Is One of the Well Drills



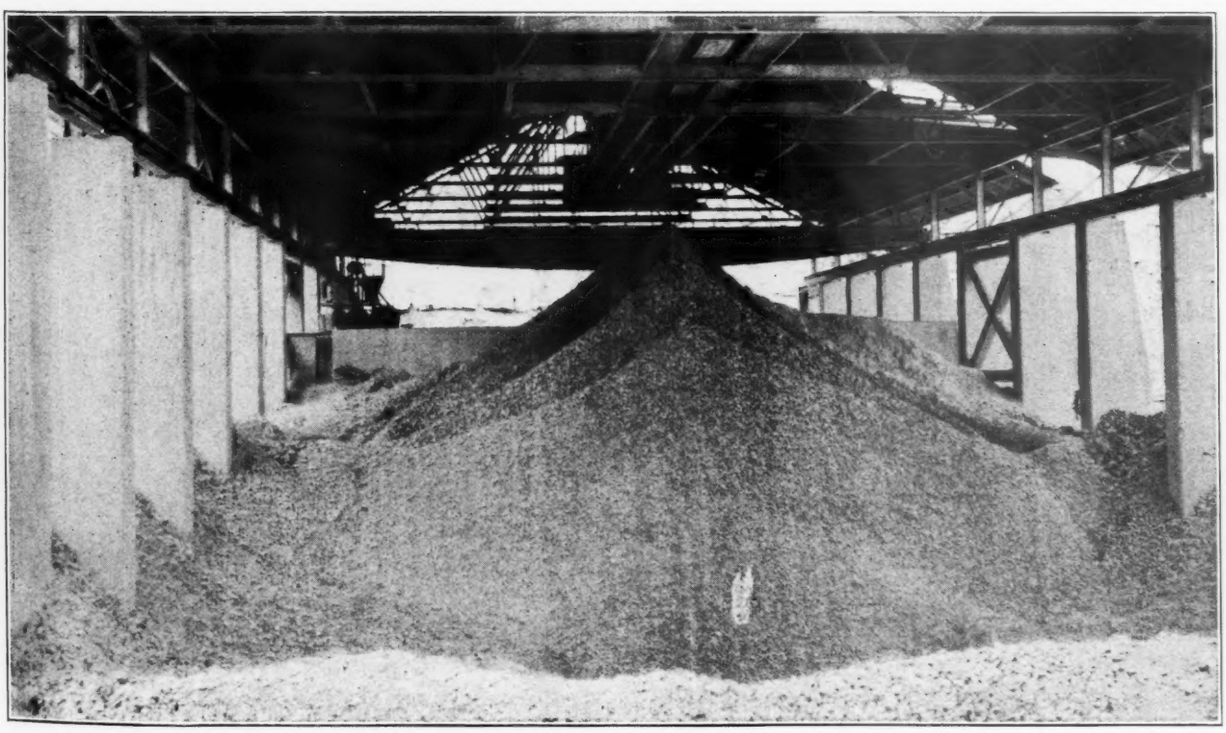
Shovel Loading Shale Into Cars. Note Fineness of Shale

The shale is rather soft and flaky and requires very little blasting. What little drilling is necessary is done with an electrically operated 1½-in. twist drill. The shale is loaded by a Marion Type 36 caterpillar steam shovel into trains of six 10-ton capacity steel side dump cars. Three 35-ton Porter saddle tank steam locomotives haul the cars to the plant. The same trains also haul the rock.

Bank shots are made in a single row on the entire height of the stone face. These shots are made about once a year and are large enough to give a supply of rock for that length of time. A shot made on April 13 of this year used 39,000 pounds of dynamite in 107 holes on a 1,700-ft. face.

Three Keystone and one Sanderson Cyclone well drills are used for drilling blast holes, all being electrically driven. These are kept busy most of the year preparing for the next large blast. Cordeau-Bickford safety fuse is used exclusively. Bank shots are made with 40 per cent and 60 per cent quarry gelatin.

A Marion Type 125 revolving caterpillar steam shovel with a 4-yd. dipper loads the stone into cars. A Marion Type 60 railroad steam shovel with a 2½-yd. dipper in the east end of the quarry is used when additional capacity is required. Ingersoll-Rand and Chicago Pneumatic jackhammers are used for secondary drilling.



Interior of Storage Building for Stone and Shale. Distributing Conveyors Are in Center Above. Overhead Crane for Rehandling Material in Background

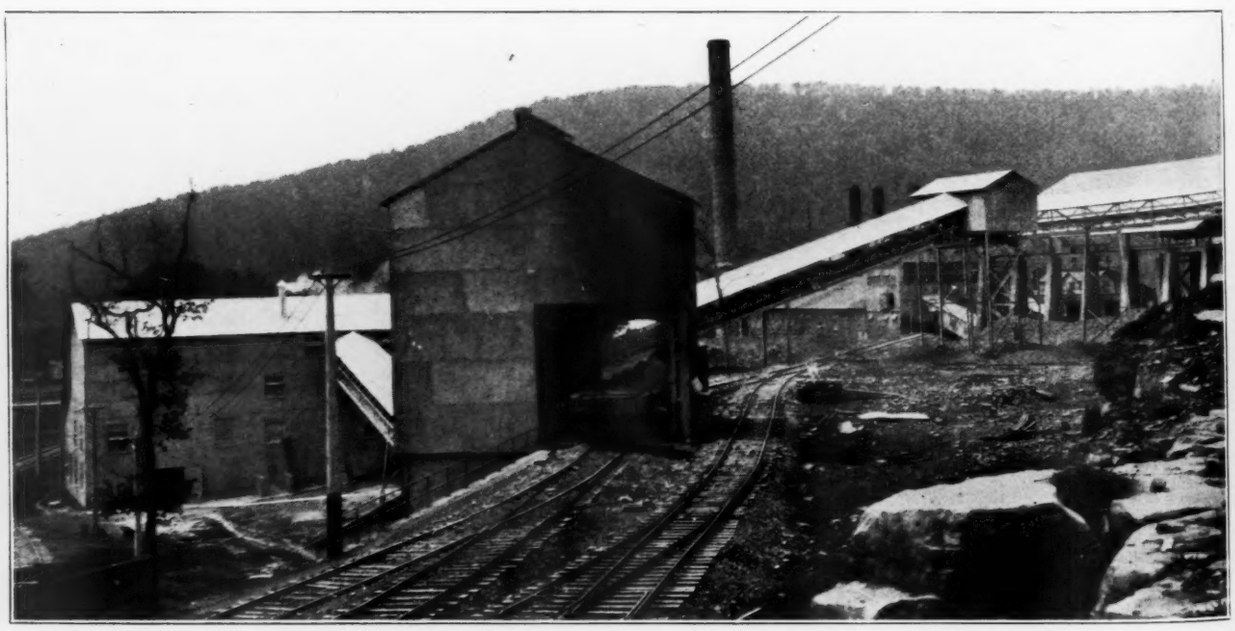
Shale and Stone Quarries from South

The Roll Crusher in the Secondary Crusher Building

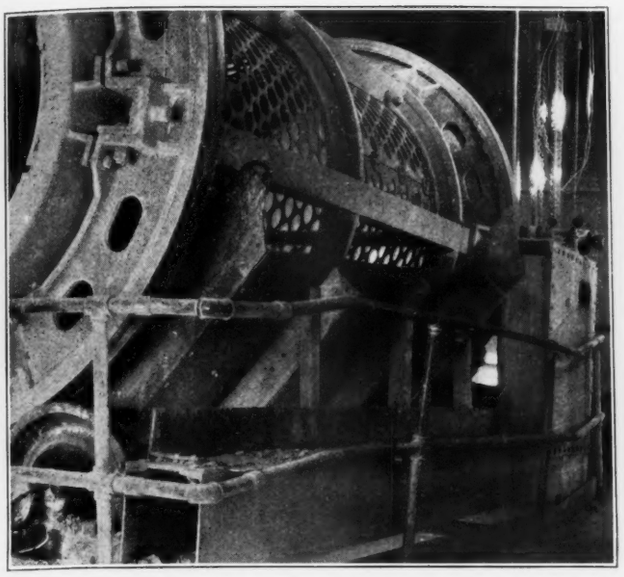
The cars containing stone and shale are run on a trestle into the crusher building and discharged into the Allis-Chalmers 42-in. Superior McCully primary crusher. This crusher reduces the material to 8-in. and under and discharges onto a 36-in. inclined belt conveyor leading to the secondary crusher building. The crusher is belt driven by a 200-hp. motor housed in a small concrete block building adjoining the crusher building. A Shepard 15,000-lb. capacity electric hoist with a 30-hp. self-contained motor on the discharge floor operates a Walsh and Weidener Boiler Company 40-ton capacity overhead crane. This is used for handling crusher parts and as a stone hook. A smaller Shepard hoist with a 10-hp. motor and enclosed drum dumps the cars into the crusher.

Crushing Operations

The conveyor to the secondary crushing building is driven by a 25-hp. motor through a Foote speed reducer. It discharges into an Allis-Chalmers Worthington revolving screen with 3½-in. perforations. The oversize (or stone) feeds through a chute into a Worthington 72-in. by 39-in. Garfield roll which discharges onto a 30-in. inclined conveyor to the raw material storage building. The material passing through the screen (shale) feeds directly onto a 24-in. inclined belt conveyor under



Closeup of Primary Crusher Building Showing Trainload of Stone Being Dumped. Secondary Crusher Building at Left and Storage Building at Right



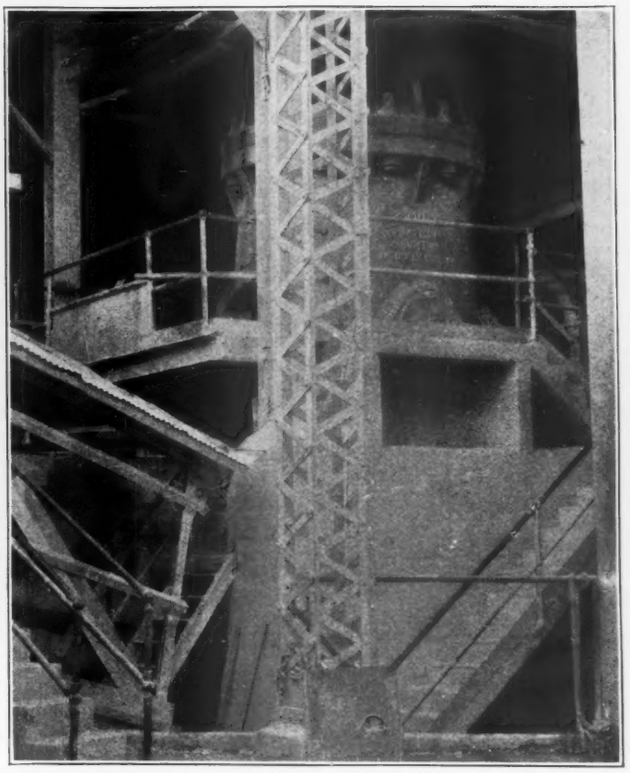
Revolving Screen in Secondary Crusher Building

the same housing as the stone conveyor to storage. The screen is direct driven by a 20-hp. motor and the roll crusher through a belt drive by a 200-hp. motor.

Raw Material Storage

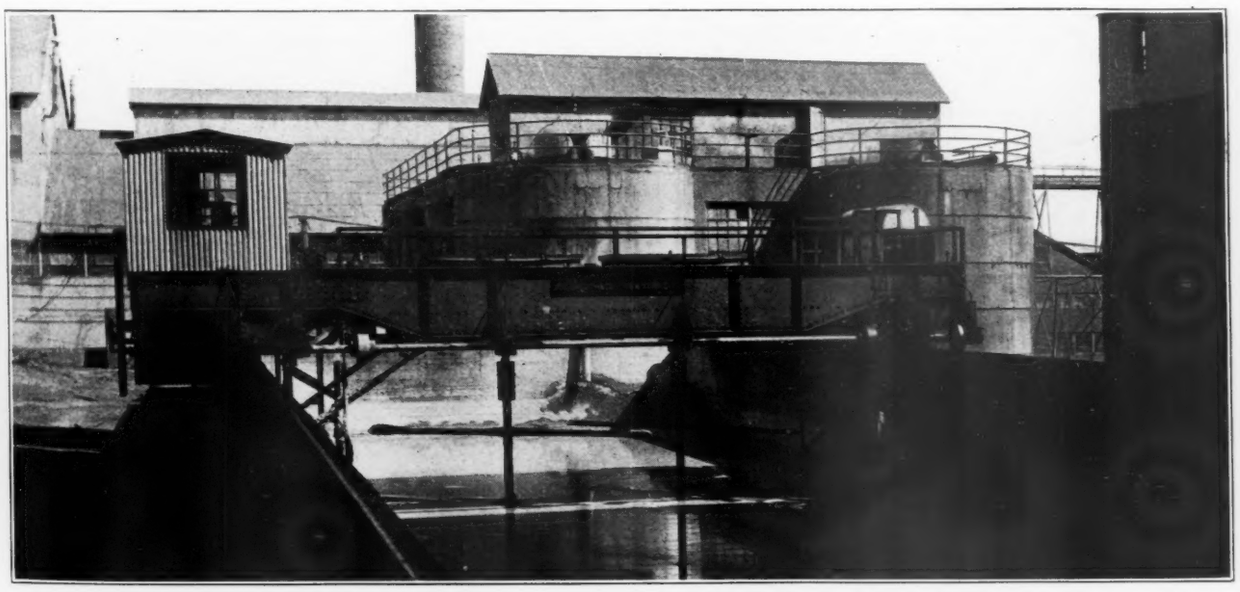
Both conveyors go only part of the distance to the storage building and discharge there onto two more conveyors on a lesser slope. The first set of conveyors are each driven through Foote speed reducers and the second set through Palmer-Bee speed reducers.

The shale conveyor feeds onto a horizontal conveyor in the storage building which discharges directly onto the shale storage pile. The stone conveyor feeds another horizontal conveyor running in the opposite direction which discharges into storage by means of a Stearns movable tripper. These conveyors are driven through Palmer-Bee and Foote speed reducers respectively.

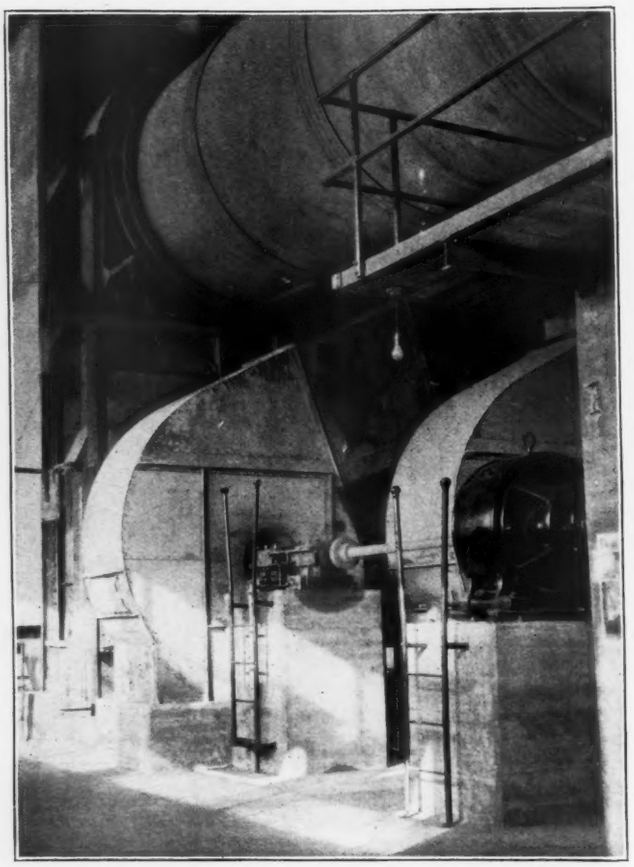


Closeup of Primary Crusher. Conveyor to Secondary Crusher Building at Left

The conveyor housing and the storage building are of structural steel construction with concrete foundations and corrugated metal roofing. The sections for shale and stone are divided by a concrete partition. The capacity is 20,000 tons of stone and 12,000 tons of shale. A Shepard overhead crane with an 80-ft. span and handling a 2½-yd. clamshell bucket rehandles both materials to the feed bins. The bins discharge to two table feeders which mix the shale and rock and in turn discharge onto two 24-in. belt conveyors in concrete tunnels under the storage piles.



Kiln Feed Tank With Traveling Agitator. Slurry Storage Tanks in Right Background



Blowers at Feed End of Kiln Which Furnish Draft

Raw Material Grinding And Slurry Mixing

The tunnel conveyors carry the material in correct proportions to the raw grinding building. Each conveyor discharges into a Pennsylvania SXT 46 hammer-mill which reduces all material to 3/4-in. and under. Water is added and the resulting mixture goes to two Smidth No. 106 Kominutors. These are each driven through single reduction gears by 300-hp. super-synchronous motors.

The Kominutors are connected in closed circuit with No. 15 Smidth "Trix" separators which take out the fines and return the coarse material to the Kominutors for regrinding. The separators have 3/32-in. screens. The ground material is fed by a screw conveyor to a catenary trough supplying three 7-ft. by 27-ft. Smidth No. 20 tube mills, each driven by a 500-hp. super-synchronous motor through a single train of open gears. The tube mills discharge into a 16-in. screw conveyor feeding the concrete blending basin where the slurry is first analyzed.

The blending basin has a capacity of 2,000 barrels and the slurry is kept in agitation by three paddle agitators, all of which are driven from a single motor through a Palmer-Bee speed reducer. Slurry is pumped periodically from the basin to the eight outdoor concrete storage tanks by an Allis-Chalmers 4-in. rubber lined centrifugal pump. These tanks are analyzed when filled and are mixed in the desired proportions. Each tank is 25 feet

Interior of Kiln Building Looking Toward Feed End of Kilns

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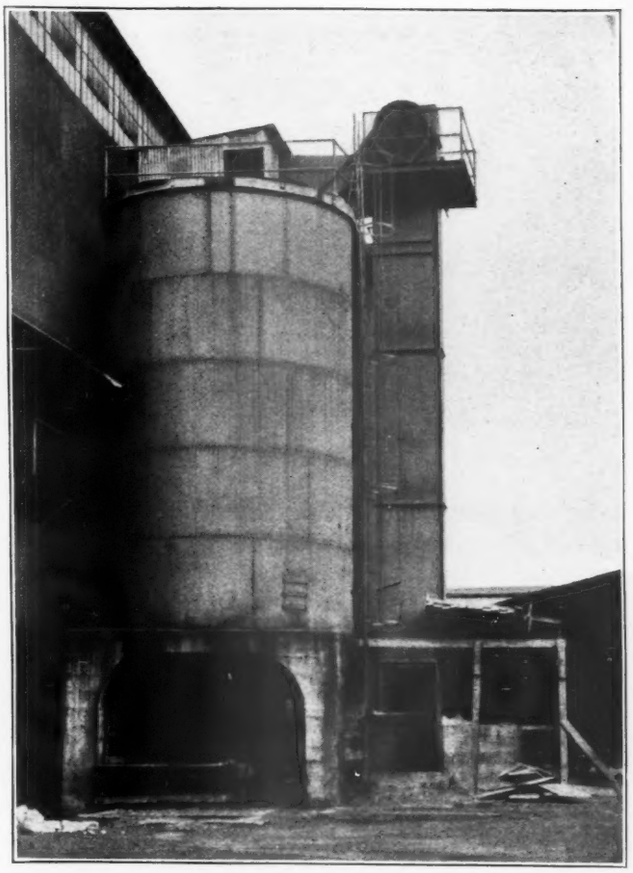
in diameter and 25 feet high and has a capacity of about 1,000 barrels.

Two more Allis-Chalmers 4-in. centrifugal pumps feed the slurry to a rectangular concrete feed basin under the kilns. This basin is 30 feet wide by 133 feet long and 16 feet deep, and has a capacity of 7,000 barrels. A Smidth traveling agitator with both mechanical and air agitation keeps the slurry in constant motion. Another set of two Allis-Chalmers 4-in. centrifugal pumps, one of which is used at a time, feed the slurry from the feed basin to a Smidth double ferris wheel feeder which discharges into the kilns by gravity.

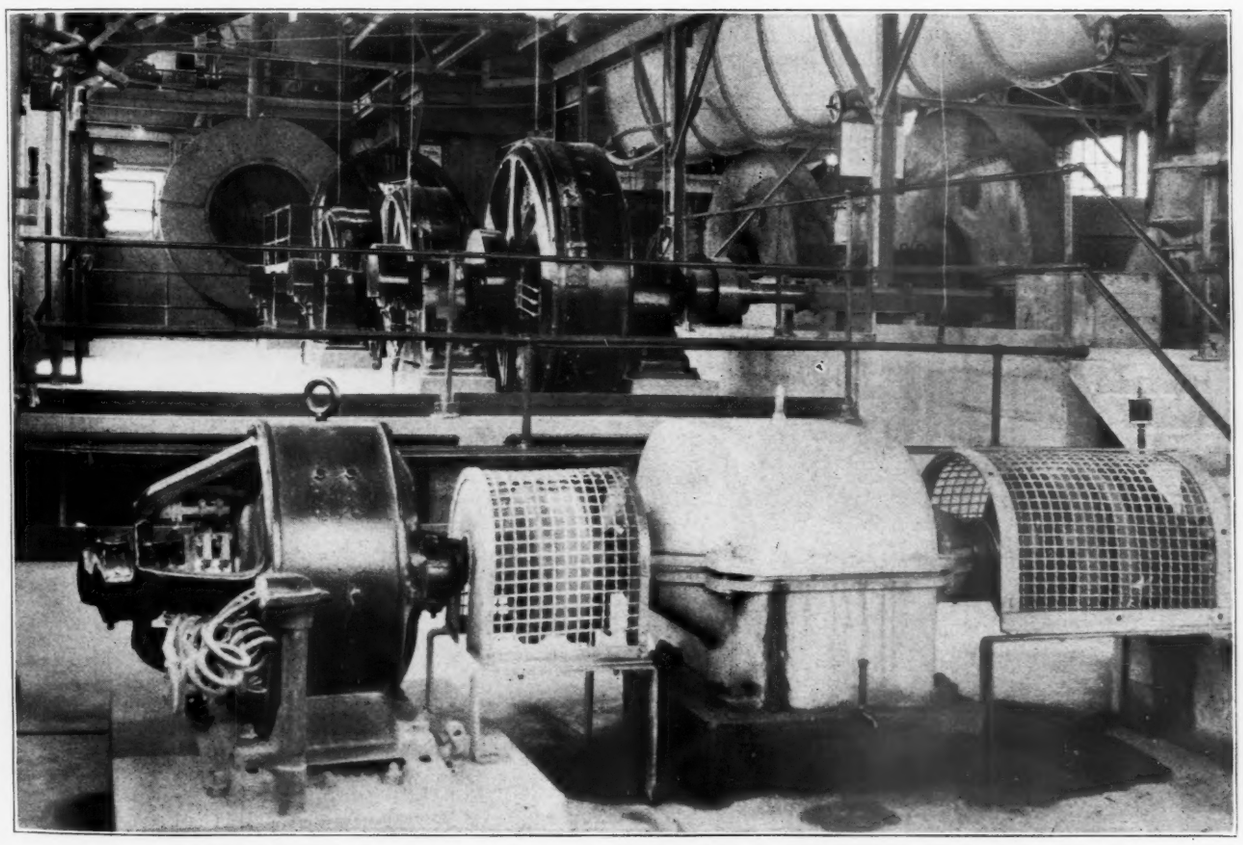
Kilns and Coolers

The two largest kilns went into operation early in 1928. They are of Reeves Brothers make and are each 343 feet 9 inches long. The diameter of each kiln is 11 feet 3 inches at the burning end and 10 feet for the remainder. Each kiln is mounted on five sets of rollers and is driven at the center by a 100-hp. motor through a Palmer-Bee speed reducer. Two Buffalo No. 11 Duplex induced draft fans create a draft for the kilns and discharge the gases into the stack. A Foxboro thermometer in the duct of each fan automatically controls a fresh air damper to prevent overheating of the fans. Each fan is direct driven by a 30-hp. variable speed d.c. motor. Pulverized coal is used as fuel.

To break up the slurry and allow more rapid evaporation of the water, a large number of heavy



Car of Gypsum Being Unloaded Into Enclosed Elevator Feeding Bins at Left



Interior of Raw Grinding Building. Speed Reducer Drive of Slurry Blending Agitator in Foreground. Raw Tube Mills at Right Drives and Catenary Feed Troughs Above. Kominutor in Left Background.

Raw Grinding Building from South. Raw Material Storage Building at Right

chains are suspended inside each kiln for a distance of about 100 feet from the feed end. There are 563 of these chain sections each 12 feet long. Cooling of the clinker is done by F. L. Smidth double drum "Unax" coolers attached to each kiln. Each cooler consists of thirty-two 3-ft. by 14-ft. cylinders in two rows superimposed around the circumference of the burning end of the kilns and rotating with them.

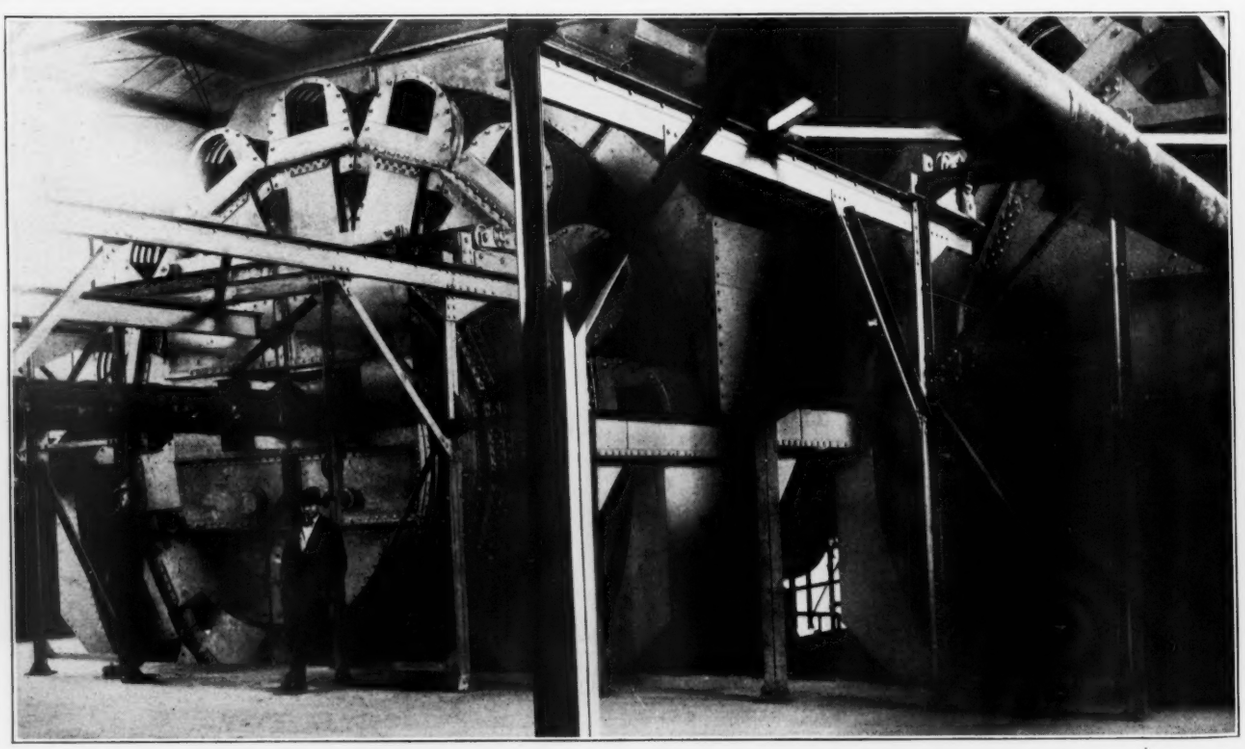
The control panel on the burner's platform carries switches controlling the speed of the kilns and feed as well as for starting and stopping the various fans, coal feed and other operations. Signal lights together with draft dials and pyrometers tell the operator at a glance the speed of each kiln, draft, condition of the damper system, temperature, and slurry feed.

With the two new kilns the plant has a capacity of 4,000 barrels per day. The ten 8-ft. by 110-ft. kilns and four 5-ft. by 60-ft. coolers left over from the old plant can still be used when necessary. With these in operation the plant has a total capacity of 6,500 barrels per day.

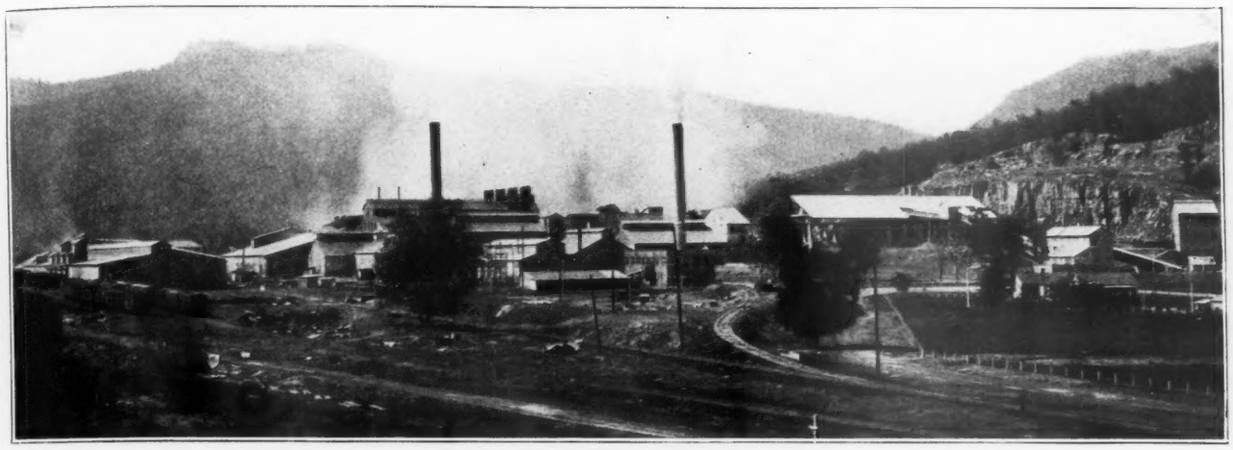
Clinker Grinding and Cement Storage and Packing

The two main kilns discharge from their coolers into a concrete trough. A Rex manganese steel drag chain conveyor feeds the clinker to an 18-in. bucket conveyor. Another drag chain conveyor carries the clinker to the finish grinding building.

Gypsum is shipped into the plant in box-cars and is shoveled out of the cars into an elevator feeding two steel storage tanks between the kiln and finish mill buildings. The gypsum discharges through gates in the bottom of the tanks into cars



Discharge End of Kilns, Showing Type of Coolers in Use. W. H. Klein, Manager of Southern Division of Pennsylvania-Dixie Cement Corporation at Left; A. E. Legg, Superintendent of Richard City Plant, at Right



Plant from Southeast. Packing and Storage Building at Extreme Left

on tracks over the clinker conveyor. The cars discharge into a hopper with a screw conveyor which feeds the gypsum onto the clinker conveyor at any rate desired. The screw conveyor is driven through a Foote speed reducer.

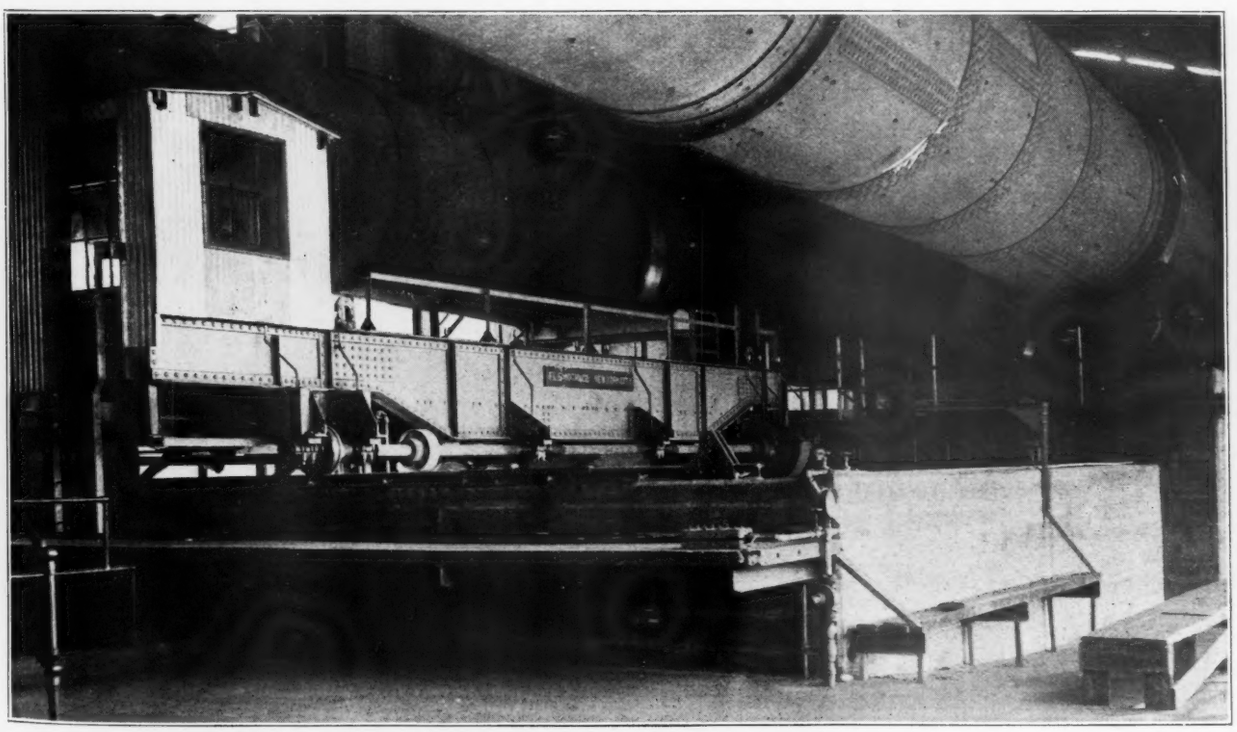
The clinker conveyor discharges into 11 steel tanks in the finish mill building with a capacity of 1,000 barrels each. These tanks feed eighteen 30-in. improved style Griffin mills. These mills are connected up in series of six to a common line shaft which is belt driven by a 250-hp. super-synchronous motor. The mills discharge into a 16-in. screw conveyor feeding an elevator which discharges into the tube mill bins. These feed into the mills through screw conveyors driven through Foote speed reducers.

The three No. 18 Smidth 5½-ft. by 20-ft. tube mills are each driven by 200-hp. super-synchronous motors through single sets of gears. The tube mills discharge onto a 26-in. Chain Belt conveyor which in turn discharges into a 16-in. distributing screw conveyor over the storage house. A Sly dust collecting system is used in the mill building.

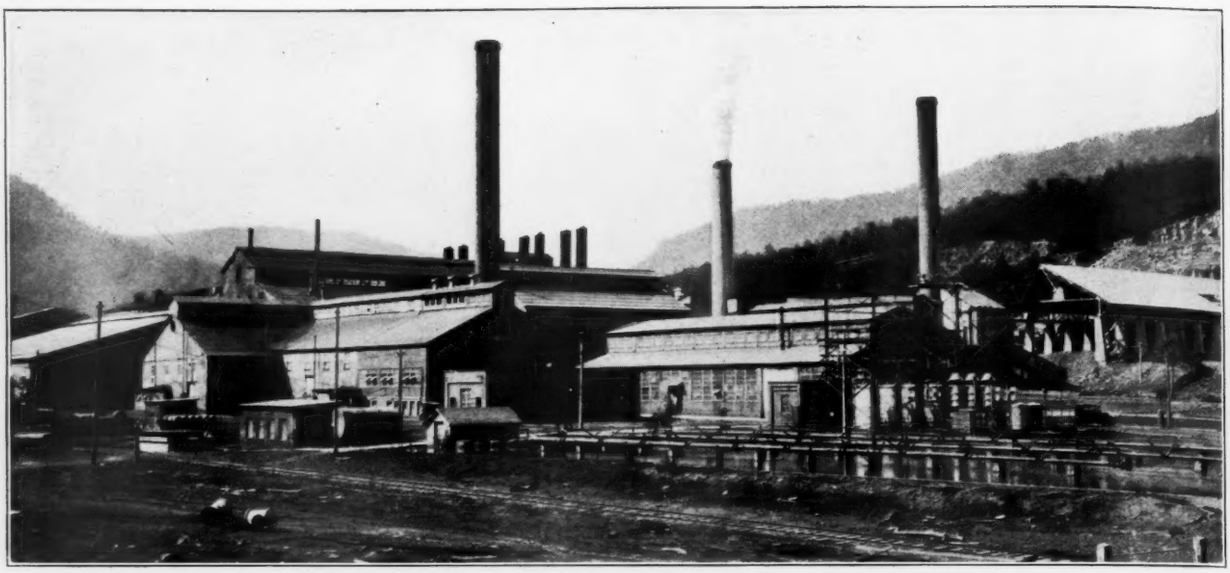
The storage house is a rectangular building 705 feet long and 80 feet wide. It contains 16 bins with a total capacity of 230,000 barrels. The cement is reclaimed from the bins by drag scrapers feeding a series of 16-in. screw conveyors which supply the packer bins. The four 3-tube Bates baggers are so arranged that the loaded sacks discharge by chutes directly into cars.

Coal

Coal is shipped into the plant in railroad bottom dump cars. That used for firing the kiln is dumped into a track hopper near the kiln building. An elevator from the bin feeds a short belt conveyor



Slurry Feed Basin and Traveling Agitator Under Kilns



Plant from South. Spray Pond in Foreground Is No Longer in Use

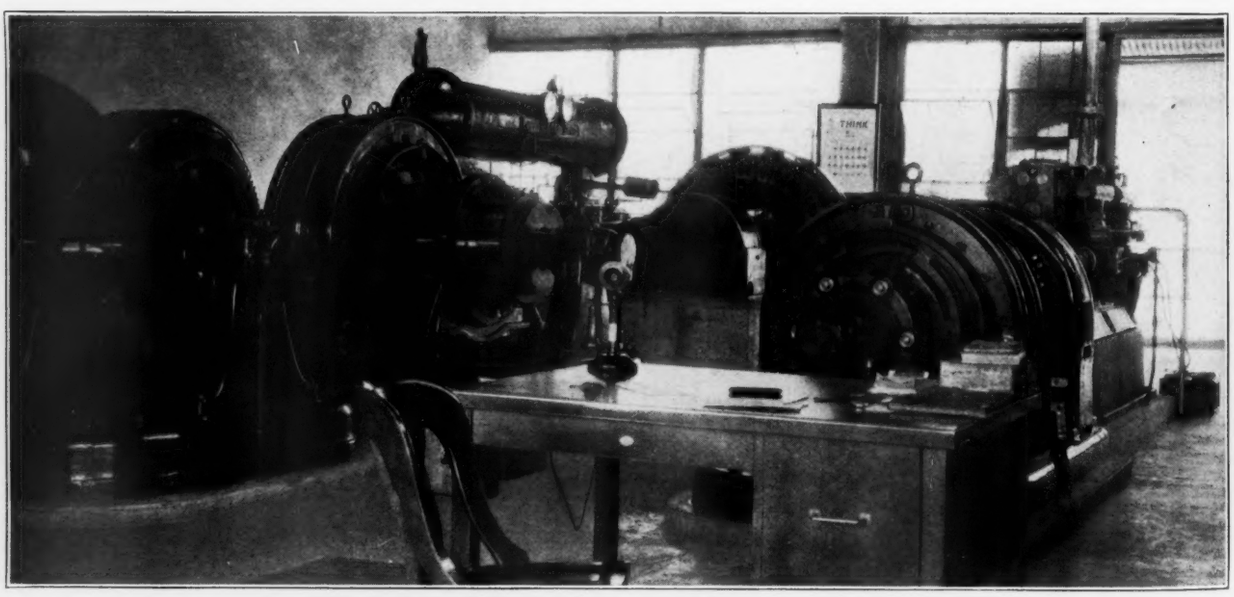
which discharges into a 100-ton capacity storage tank. Coal discharges from the tank by means of a table feeder and elevator to a 6-ft. by 50-ft. rotary drier. The drier discharges into a bucket elevator and screw conveyor to five hopper bottom concrete tanks which feed five 42-in. Fuller mills. Pulverized coal from these mills is conveyed to the kiln feed tanks by a 6-in. Fuller-Kinyon pump. A Williams hammer-mill at the track hopper allows run-of-mine coal to be used if desired.

Coal for the locomotives and shovels in the quarry is also delivered direct from the mines. The cars discharge into a track pit from which the coal is elevated into a 50-ton capacity concrete bin. The locomotives are coaled through a gate in the side of the bin. Coal for the shovels is hauled in quarry cars. The bin structure also supports a water tank for the locomotives and shovels. Water for all plant operations comes from the Tennessee river two miles away.

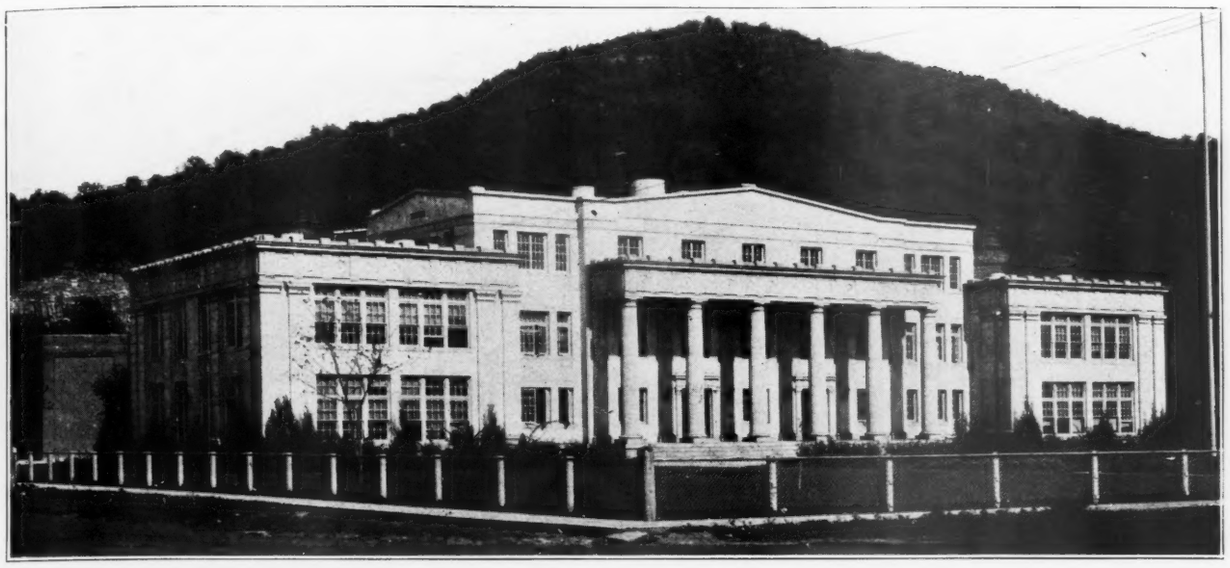
Machine Shop and Store Rooms

An unusually complete machine shop is maintained in which practically all plant repair work is done. Two overhead Shepard cranes handle repair parts. A track from the quarry allows cars, etc., to be run into the shop for repairs. A storehouse adjoining the machine shop carries a complete stock of repair parts. The small parts are neatly stored in racks while the larger parts are kept on the second floor of the building. An elevator is used to handle these.

Two small concrete block buildings at the quarry are used, one for the quarry office and tool room and the other for a machine shop and sand drier room.



Interior of Power House. Air Compressor in Background, Motor Generator Sets at Left, Emergency Generator at Right



The Dixie Portland Memorial School

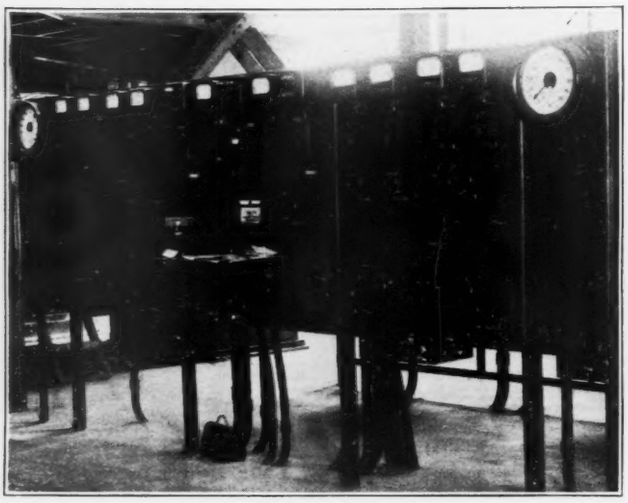
The Power House

Electric power comes from the lines of the Tennessee Power Company at 44,000 volts. This is reduced to 2,200 volts at an outdoor transformer station for general plant operations. The power house at the plant contains three 500 kw. Electric Machinery Manufacturing Company motor-generator sets for converting 2,200-volt alternating current to 240-volt direct current. An emergency unit is maintained to generate current to operate the kilns in case of power failure. This consists of a 300-hp. Sterling Dolphin 8-cyl. gasoline engine driving Electric Machinery Manufacturing Company 175-kva. 2,300-volt and 150-kw. 240-volt generators. There is also an Ingersoll-Rand Class PRE2 air compressor with 12½-in. by 14-in. and 20-in. by 14-in. cylinders driven by a 225-hp. synchronous motor. A large panel switchboard controls all plant operations. All of the large super-synchronous motors throughout the plant are controlled from this switchboard.

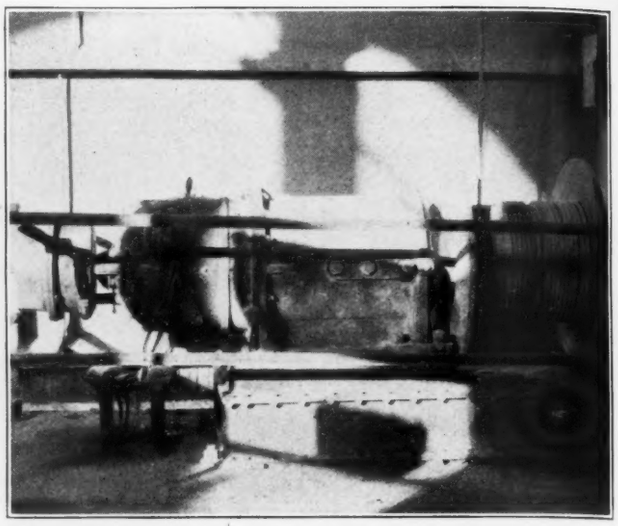
Office Building and Laboratories

The office and laboratory building is a neat two-story stucco and concrete building. In addition to the superintendent's and plant offices, it contains a drafting room, and chemical and physical laboratories. There are also large and well equipped shower and locker rooms, one for white and one for colored employes.

Penn-Dixie Baseball Team, Which Last Year Won the Championship of the Sequatchie Valley



Board from Which All Kiln Operations Are Controlled



Hoist With Self-Contained Motor Which Operates Stone Hook and Crane Over Primary Crusher

Physical testing equipment consists of a Riehle electric 200,000-lb. capacity compression testing machine, a Tinius Olsen 100-lb. capacity automatic briquette tester, a Tyler "Ro-Tap" electric sieve shaker and sieves, Sturtevant sample grinder and 6-in. jaw crusher, Abbe ball mill and other miscellaneous equipment. The chemical laboratory also is completely equipped for making all necessary tests.

Miscellaneous

The town of Richard City in which the cement plant is located got its start when the cement plant was first built in 1907. It now has a population of over 1,500. The president of the Dixie Portland Cement Company which built the plant and operated it until it was sold to the present owners was Richard Hardy, after whom the town was named. One of Mr. Hardy's ambitions was to build a modern school building for the children of his employes. This ambition was realized when the Dixie Portland Memorial school was completed and dedicated on April 28, 1926, shortly before Mr. Hardy's death. The school is modern in every respect and was built at a cost of about $300,000. The present enrollment is over 350.

There is also a school for colored children and a village of 25 houses for colored employes. These are all owned by the company.

A hotel for single employes is also maintained by the company. In connection with it is a hospital with a company doctor and nurse in attendance at all times. A greenhouse is maintained which supplies flowers for the school, hospital and offices.

Baseball is perhaps the favorite sport among the employes. The baseball team last year won the championship of the Sequatchie Valley League out of 16 teams.

Officers

A. E. Legg, superintendent of the Richard City plant maintains his offices at the plant. W. H. Klein, general manager, and W. L. Pearson, purchasing agent, respectively, of the Southern Division of the Pennsylvania-Dixie Cement Corporation maintain their offices in the James Building, Chattanooga, Tennessee. The main offices of the corporation are in New York City. Blaine S. Smith is president and John A. Miller is chairman of the board of directors. George Kilian is secretary-treasurer.

Asphalt Interest to Convene

The Asphalt Association and the Association of Asphalt Paving Technologists will hold the eighth annual Asphalt Paving Conference at West Baden, Indiana, October 28 to November 1. The improvement of farm-to-market roads will be the keynote of the meeting, and special discussions will be held as to the most economical methods for the construction of low-cost asphalt surfaces on secondary and tributary highways. Other matters to receive attention include airport paving, city street construction and trunk-line highway improvement.

Roads in Spanish Zone, Morocco

There is a continued improvement in the roads of the Spanish Zone and the Spanish high commissioner is giving special attention to this development, according to Consul Horace Remillard of Tangier in *Foreign Highway News*. He has divided the highways into two classes: (1) commercial roads for general travel and (2) military roads of restricted utility. It is reported that the highways Ceuta-Tetuan and Tetuan-Tangier have been much improved, and that work is being satisfactorily prosecuted on the Tetuan-Melilla road.

Suggestions for Minimizing Accidents in Quarrying and Crushing

By H. R. LEH, Superintendent Lone Star Cement Company, Pennsylvania*

IN YEARS gone by we were inclined to believe that the various departments in their regular course of operation must have a certain number of accidents each year. But this old theory has been so thoroughly exploded that we have an entirely different conception. Records show that some departments have gone three years or more without an accident, which brings up the question, "Why can this be accomplished in some cases and not in others?" The operations are more or less similar. Therefore, I shall cover a few points which, to my mind, are reasons for failures in some plants. To do this, let us proceed in the usual sequence of operation.

Stripping and Drilling

Stripping should be carried back of the edge of the face, and kept a safe distance—100 feet is not any too much—so as to prevent loose dirt and rocks from slipping and rolling over the edge into the pit. Primary drilling is a comparatively simple operation. However, special precautions and thorough examinations should be made of the nature of the rock to be drilled and all crevices and faults; and the burden of the proposed blast should be studied before deciding the spacing of the drill-holes. I am inclined to think we frequently go by experience and routine in the spacing of holes rather than by a careful study of conditions as they actually exist. If unusual conditions such as clay seams, extra compact or loose rock, or depth of water are encountered when drilling, they should be noted. Later all such knowledge will be helpful in determining the proper strength and amounts of explosives in the various holes.

Blasting, Loading and Handling of Explosives

The first point to consider in the use of explosives is their storage. We should have a competent man in sole charge of the magazine which should at all times be kept locked. Cases should be neatly piled proper side up as marked, oldest stock always moved out first, and the floor kept clean and free from grit; and especially should all metallic materials such as shovels and picks be kept away from the magazine. Needless to say, fuse and exploders should be stored a considerable distance from the main magazine.

If men must carry the explosives, be sure they have a good clean, even path. A man carrying 50 pounds of high explosive certainly needs sure footing.

In loading there should be allowed plenty of time so there is no need of rushing. The loading crew should know exactly what each man's duties are and the work should be done in an orderly, precise manner. No smoking or fires of any kind should be allowed at or near the scene of operation. The carrying of any matches in clothing of the loading crew should be absolutely prohibited, and all strangers should be kept away.

The surface surrounding the blast-holes should be kept as even as possible. Cases should always be opened with wooden tools. The shells should closely fill the size of the holes. If cartridges are slit with a knife, it should be a very dull one and the slitting should be done very carefully and slowly.

Do as little tamping as possible and then only with wooden tamping stocks, being careful not to injure blasting cap wires or the cordeau. For stemming there is nothing better or safer than dry, clean, free-running sand, as this will not require any tamping. Never connect wires or cordeau until just prior to the time of blasting, and certainly never connect any blasting caps or exploders to main lines until everyone is in the clear. It is known that wires lying on the ground will collect enough static to set a blast off without any other means. We prefer cordeau as it is safer and the chances of misfire are practically nil.

In secondary blasting provide two sheet-iron-covered wooden magazines to hold just enough for one day's supply, the explosives and exploders to be stored separately, each in its respective magazine. Also, for the blaster to carry his supply from the secondary magazine to the scene of operation and back, provide two covered wooden boxes, one for explosives and another for exploders and fuse.

Inspection of Face

After blasting, especially after primary blasting, comes the inspection of the face of the quarry, one of the most necessary parts of a successful no-accident quarry operation. The foreman should be on the floor of the quarry, to call attention to dangerous hanging rocks, which are usually found to the right and left of the holes that have been fired. The use of long, slender poles is helpful if the loose rocks can be so reached. If not, a man should be let down on a rope and a substantial harness, carefully to remove all traces of such

* Portions of a paper read at Washington regional safety meeting, April 2, 1929.

danger. This must be carefully watched at all times, but especially so in the spring of the year, when alternate thawing and freezing has a tendency to dislodge rocks. Even the action of well drilling has caused rock to fall out of faces.

Shovels and Other Equipment

Proper inspection of chains and cables weekly, in addition to the daily inspection of boom, dipper sticks and dippers, for loose nuts, bolts, and parts is necessary. All bolts in sheave wheels should be provided with cotter pins.

Loading and Transportation

Improper loading or overloading of cars may allow rocks to fall off while in transit to the crusher, which may mean a fractured skull, a broken limb or smashed fingers or toes.

We have entirely too many accidents caused directly or indirectly by our quarry or rock-transportation systems. Tracks must be properly laid and maintained with rails of sufficient weight to handle the equipment without becoming surface bent and out of line; curves not too short; a good quality of switches and points; good substantial ties of sufficient number properly to support the rails; and a suitable amount and location of derails.

Inclined Planes

Perhaps the two main causes of accidents at planes are rocks falling off cars, and hoisting-cable failures. The former can be prevented by careful loading, by protection at and near plane by guards which will keep men away from the range of falling rocks, and by allowing no one to ride out of the pit on cars. The cable hazards require careful and proper inspection of cables weekly and records of such inspection kept in a book. The inspection should include a test-run each morning, at which time the cable should be called upon to sustain the maximum load to be hauled out of the quarry throughout the day with a factor of safety of at least 2.

Crushing

The most frequent major accidents at and around crushers are caused by trying to feed rocks into a crusher too small to handle them. This can, to a certain extent, be eliminated by secondary blasting and the use of certain size dippers on shovels so as to allow only the proper rocks to go into the cars. If this should not be practical, then the shovel operator should be educated as to the maximum size of rock that the crusher will handle, and all rocks that are too large should be laid aside for preparation. A material help at the crusher is a quick-acting air or electric lift with a proper hook always suspended about the crusher. In any event, crushers should have a guard entirely around them at least 36 inches high. Men can use a bar over such a guard and still be protected from falling into the crusher. If necessity compels a man to go within the guard, he must wear a life-belt attached to life-lines of such length as will prevent him from being drawn into the jaws of the crusher or from being sucked under by a sudden rush of materials.

When crushing machinery is stopped for repairs, the person making such repairs should hold the key to the electric circuit. Every rock elevator should be equipped with a safety-backrun brake to eliminate any chance of the elevator reversing itself, due to the load therein contained.

General

Years ago, when we loaded rock by hand, we employed the very poorest kind of labor and required only that men were able to break rock with sledges, load it on cars and know how to drive a mule; but today with high-speed electric shovels, fast-moving dinkeys and cars, automatic car-dumps, mammoth feeders and crushers, it is necessary that we employ intelligent labor in the quarries. Many of us have improved our mechanical equipment but have failed to improve our organization by proper instruction.

When employing a new man be sure to instruct him as to the hazards that may exist, then as to the nature of the work; and, if necessary, have another man with him until he thoroughly understands his duties.

What I consider the most important point in decreasing accidents, especially in quarries, is good housekeeping, orderliness and cleanliness. All materials in and around quarries should be placed or piled in an orderly manner. How can we expect men to work safely if we have rails, ties, shovels, picks, ropes, chains, cables, scrap and what-not lying in disorder all over the quarry, and especially loose rocks covering the floor and along tracks? At times a man must run a few steps from an oncoming blast or to block a car, or to turn the air or water off or on; when one mis-step may mean an accident. Therefore, let's keep our quarries so clean that a man can walk or run anywhere at any time without danger of falling.

Lime Association Meets

(*Continued from Page* 45)

lime to soils, and a professional engineer who will handle technical construction problems.

These proposed expansions are assured through the adoption of a budget for the next three years. This will provide an operating fund by a pro-rata assessment of members, based upon the gross tonnage of each preceding calendar year.

American Standards Association and Bureau of Standards Adopt Agreement

A COOPERATIVE agreement between the American Standards Association and the U. S. Bureau of Standards which will encourage national standardization activities in all industries was ratified July 9 by George K. Burgess, director of the Bureau of Standards and by the board of directors of the American Standards Association at the board's first meeting.

The board also considered the invitation extended to the American Standards Association to join with the national standardizing bodies of fourteen European countries in the International Standards Association which has its headquarters at Baden, Switzerland. It was decided, however, that this matter should be held over for consideration at the next meeting of the board to permit further study of the methods by which the American Standards Association could cooperate with the foreign bodies.

The board also decided to launch an extensive national campaign to finance industrial standardization activities on a basis merited by the tremendous savings which these activities are securing for American industry. A finance committee consisting of Bancroft Gherardi, chairman, Quincy Bent, and Howard Coonley was appointed to head this effort.

The meeting was the first held by the board since its appointment, which followed the recent reorganization of the association. The members of the board are: W. J. Serrill, president of the A. S. A. who is also chairman of the board; Cloyd M. Chapman, vice-president of the A. S. A.; C. E. Skinner, past president of the A. S. A.; Quincy Bent, vice-president, Bethlehem Steel Company; George K. Burgess, director, Bureau of Standards; C. L. Collens, president, Reliance Electric & Engineering Company; Howard Coonley, president, Walworth Company; L. A. Downs, president, Illinois Central Railroad; Bancroft Gherardi, vice-president, American Telephone & Telegraph Company; F. E. Moskovics, president, Improved Products Corporation; M. S. Sloan, president, New York Edison and affiliated companies; R. J. Sullivan, vice-president, Travellers Insurance Company.

Under the terms of the agreement with the Bureau of Standards, the primary effort of the bureau will be to serve those industrial groups which have no satisfactory standardization facilities of their own. The bureau will help these groups to formulate temporary standards designed to meet immediate requirements. The American Standards Association will work primarily with those bodies having standardization facilities and will bring together such groups for the formulation of "American Standards," which represent a true national consensus of approval. Where feasible, temporary standards prepared with the aid of the Bureau of Standards will be brought before the American Standards Association for advancement to the rank of "American Standards."

The American Standards Association is a national federation of forty government, technical and trade associations and includes the U. S. Department of Commerce, of which the Bureau of Standards is a division, in its membership.

The following statement of the cooperative relations of the American Standards Association and the Division of Trade Standards of the Bureau of Standards has been formally endorsed by the association and by the bureau, and is issued with their joint approval for the information of all who are interested in industrial standardization:

1. The American Standards Association is the agency through which standardization by trade associations, technical societies, and governmental agencies is advancing in the United States on a broadly national scale. The association is maintained by a group of national organizations, industrial, technical, and governmental, at present 40 in number.

2. The association imparts a definite status to standards which are prepared by industry in accordance with the association's procedure, through declaring them American Standards, after a consensus has been reached among the various groups substantially concerned — producers, consumers, distributors, and general interests.

3. The National Bureau of Standards, through its Division of Trade Standards, is acting as a centralizing agency for industrial and commercial groups requesting its cooperation in the adjustment, application, and promotion of standards that will facilitate production and marketing of the commodities which concern the requesting group. After proper acceptance of such standards by the interests immediately concerned, the bureau publishes them as the "Commercial Standards" of those interests. Primarily, the effort of the bureau is to serve those groups which have no satisfactory standardization facilities.

4. Since "Commercial Standards" are obviously of interest to groups immediately concerned with the manufacturing and marketing of specific commodities, such standards are not considered to have the same status as is imparted to standards approved as American Standards by the A. S. A., though it is hoped that some Commercial Stand-

ards will eventually receive such approval. Commercial Standards are temporary standards.

5. In the advancement of Commercial Standards to the status of American Standards, the Bureau of Standards may serve as the sponsor for a given project if it shall appear that such sponsorship is desired by the proponent group and if such assignment is consistent with other sponsorships and with the regular practice and procedure of the A. S. A.

6. With reference to changes or revisions of a standard for which the bureau acts as sponsor, the bureau will, under the A. S. A. procedure, in the same way as other sponsor organizations, assume responsibility for presenting the proposed changes to the proponent group for consideration and action.

7. The foregoing does not apply to Simplified Practice Recommendations since the bureau endeavors to keep the elimination of unnecessary varieties a separate function.

New England Lime Operators Hold Third Annual Conference

The third annual conference of New England lime and limestone manufacturers and their agents was held July 16 and 17 at the Connecticut Agricultural College, Storrs, Connecticut. The general topic of discussion was "Factors Related to the Increased Use of Soil Liming Materials in New England."

After registration on Tuesday afternoon, July 16, dinner was served in College dining hall. At this function President George A. Works of the college made an address of welcome, and E. O. Fippin, former manager of the National Lime Association, spoke upon "Some Problems of the Lime Industry."

The following forenoon was devoted to a program which, as will be observed, was divided into four discussions.

The Demands of Connecticut Crops and Soils for Liming Materials—

M. F. Morgan, Connecticut Agricultural Experiment Station, leader.

1. The Reaction of Connecticut Soils—M. F. Morgan.
2. Pasture—B. A. Brown, Storrs Experiment Station.
3. Tobacco—Dr. P. J. Anderson, Windsor Tobacco Station.
4. Vegetables—A. T. Stevens, Connecticut Agricultural College.
5. Clover and Alfalfa—J. S. Owens, Connecticut Agricultural College Extension Service.

The Fineness of Soil Liming Materials—

1. Dr. Henry Dorsey, Connecticut Agricultural College.
2. C. P. Tomlinson, Grangers Manufacturing Company.

Some Problems in Supplying the Lime Needed—

Dr. E. A. Perregaux, Connecticut Agricultural College Extension Service, leader.

1. The Dealer's Problems—
   E. H. Jones, Apothecaries Hall Company, Waterbury, Connecticut.
   M. H. Lockwood, Eastern States Farmers' Exchange.
   L. P. Townsend, New England Retail Grain Dealers' Association.
2. The Problems of the Car-Door Agent—
   A. H. Davis and others.
3. As the County Agent Sees Them—
   H. C. Norcross, Litchfield County.
   R. K. Clapp, New Haven County.

Other Problems—

Burton K. Harris, lime manufacturer, Saylesville, Rhode Island, leader.

1. The Manufacturer's Problems—
   F. A. Daboll, Miller Lime Corporation.
2. Transportation—
   W. J. Landon, assistant freight agent, New Haven Railway.
   E. E. Regan, general superintendent, New Haven Railway.
3. Increasing the Market—
   R. C. Parker, formerly field agent, National Lime Association.

After luncheon S. McLean Buckingham led a discussion upon "What the Farmer Thinks About Using Lime." An inspection of pasture experimental work concluded the conference.

Study of Mica Situation

Steady progress is being made in the survey of the domestic mica situation being conducted by the United States Bureau of Mines, Department of Commerce, in cooperation with the War Department. F. W. Horton, of the Bureau of Mines, has visited the principal mica deposits in Maine, New Hampshire, Connecticut, New Mexico, South Dakota, Virginia, North and South Carolinas, Georgia, and Alabama. He has also called on most of the leading manufacturers in the country, studying their methods and requirements.

The field studies so far conducted indicate that an abundance of mica may be obtained from domestic mines. It has therefore seemed wise to have tests made for dielectric strength and other properties of samples from typical deposits for comparison with foreign mica. Such tests are to be made by the Bureau of Standards, and 34 selected domestic micas and various grades of Indian and Madagascan.

Rapides Gravel Company Successfully Meets Overburden Problem by Hydraulic Dredging

LOCATED in the central region of Louisiana, about twenty miles south of Alexandria and three miles east of the little saw-mill town of Woodworth, is the plant of the Rapides Gravel Company. The operations are of interest because of the successful production results obtained in the face of unusual field problems.

The deposit is typical of field conditions found in this part of the country wherein the available, workable sand and gravel deposit areas are for the most part overlaid with variable depths of overburden of various formations. The overburden ranges from ordinary, shallow layers of top soil to tough, clay-like, blanket strata which are occasionally infiltrated with iron-ore conglomerate. The thickness of the overburden reaches 10 and 12 ft. in many places.

The choice sand and gravel aggregates range in excavatable bed depths from 50 to 60 ft. On the avverage about 40 ft. of bed depth is below water-level. The aggregates vary in size from fine sand to gravel solids ranging to approximately 2½ inches in diameter. The sands are sharp and the gravel is mostly hard flint. Not many over-size gravel pieces are encountered, thus reducing crushing work to a minimum. The average run of gravel sizes requires only screening gradation for commercial classification.

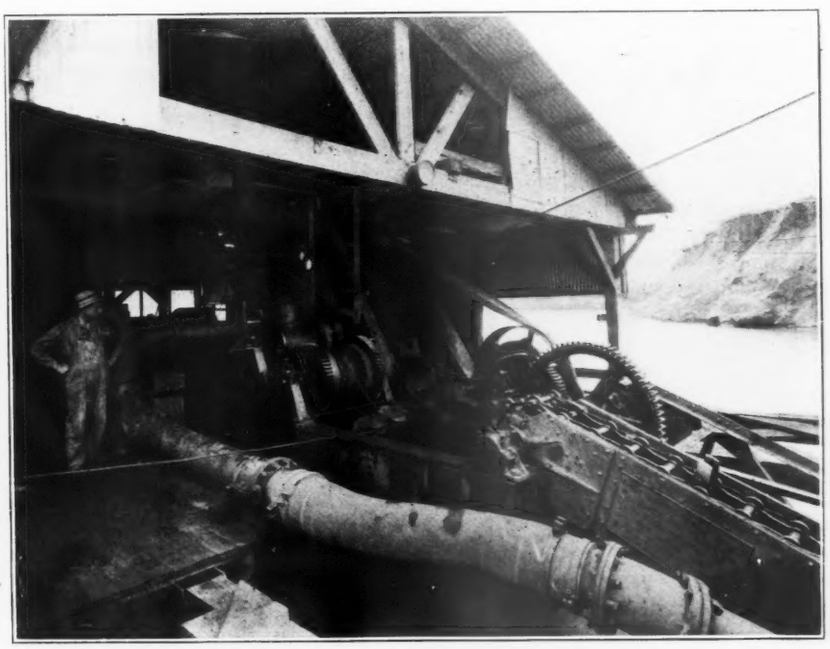
Because of the abundant water supply and the fact that the majority of aggregates lies below water level, this company uses a pump dredge, mounting a chain-type digging ladder, with a pontoon discharge pipe-line leading directly to the shore screening plant. It has been found more economical to dig the overburden with the underlying aggregates rather than to strip it. From a digging standpoint, the overburden materials at times offer obstinate problems, especially the clay layers and iron-ore conglomerates. When they resist cave-in action, dynamite is used. The dredge digging ladder, because of its chain-opening size, affords steady and continuous excavation of the deposit, particularly after a dynamite shot, because it screens from the suction pipe-line mouth-piece any overburden chunks too large to be handled in the pipe-line system. A considerable portion of the overburden is pumped to the shore plant; most of it is disintegrated and floated away. The ladder's traveling-chain carrier attachments automatically lift all oversize pieces from the region being dug and drop them into the pond just ahead of the dredge boat proper. Now and then considerable amounts of clay-ball are encountered and conveyed to the shore plant. The operators have devised a practical method for removing such clay-balls from completed sand and gravel products.

The shore plant is of timber construction, well braced and of minimum vertical elevation. The side columns and platform supporting the main screens form an arched structure over a single track which is used principally for loading gravel cars. An adjoining track is used for loading sand cars. The pumped mixture empties from the pipe-line into a large box which arrests the velocity and aids in dewatering. The materials leave the box as a wet sludge and are directed over an arrangement for removing clay-balls and excess sand from the commercial aggregates. A small battery of bar-type sloping screens and flumes with perforated plate bottoms exclude most of the clay-ball particles. Little hand picking is needed to complete the removal of these balls. Practically all pumpage water and excess sands are removed from the aggregates before they enter the main screen. The main screen is a specially designed rotary, provided with both sand and gravel sections, jackets, and a long scrubber at one end, fitted with radial baffle plates. Any commercial sizes and mixtures can be made.

Most of the wastage water, sands and overburden debris are carried from the shore plant, by a long flumeway, to a shore sump. Thence a relay dredge pump, with a long pipe-line, conveys them to a spoil area at the extreme end of the property. This practice obviates covering nearby excavatable acreage. By not allowing wastage to return to the operating pond, a large, permanent reservoir of fresh clean water is maintained.

The tracks and plant have been laid out so that the discharge pipe-line from the dredge will not exceed a length of 600 ft. This maximum length was chosen because it minimizes power unit requirements. The pond area, paralleling one side of the track, is a rectangular strip of fairly uniform width and increasing length as the work progresses. For a given set-up the shore plant serves as a pivot for the swing of the dredge with the discharge pipe as a radius.

When it becomes necessary, the shore plant can be moved to a new location on the track. The plant can be moved as a unit. In moving the plant, a long gondola car is spotted underneath the plant and blocked to the rails. With cribbing and jacks, the plant is raised so that its columns



Operator's Position, Front End of Dredge Boat

General View of Dredging Operations

clear the anchor dowel bolts of the concrete foundation. To insure stability during the transfer, the car and its load are braced to another car on the parallel track. New foundations are prepared, and the plant can be placed on its new foundations by removing cribbing and lowering the jacks. A 500-ft. move of plant can be effected in about two days' time.

For all power demands Fairbanks-Morse & Company full-diesel types of engines are used. All drives are by belt. The boat uses a 240-hp. engine, the shore plant is driven by a 50-hp. unit, and the shore-sump relay dredge pump has a 180-hp. engine. These engines provide ample reserve factors.

The pond is from 30 to 40 ft. deep and now covers about 10 acres. The screening plant is at its second set-up. As shown in the picture, the length of the discharge pipe-line is about 500 ft. The dredge swings sideways, slowly, by steps of several feet at a time. A joint of pipe is added to the discharge pipe-line when the radius of swing of the dredge is increased.

The hull of the dredge boat is of heavy timber construction with five solid timber kelsons thoroughly braced to the side and front gunwales. The machinery rests on heavy timber cribbing which is supported by the timber floor beams. The boat is 60 ft. long by 32 ft. wide and 6 ft. deep. The cabin is covered with sheets of corrugated iron. The digging ladder is supported by two forward pontoons of timber construction. They are each 25 ft. long by 10 ft. wide and 5 ft. 3 in. deep. There is an open well width of 12 ft. between their inner sides and 11 ft. clearance between the dredge boat and their rear ends. They are yoked by a heavy, braced frame. The hoisting tackle of the ladder is carried by a timber A gantry placed in a forward-leaning position. Heavy stringer timbers connect the pontoons and the dredge boat. The pontoon stringer timbers are fastened with pin-hinge connections whereby the pontoons and dredge boat ride independently of one another, thus avoiding undue stresses from wave actions of the water when the deposit bank is dynamited. The discharge pipe is supported by open-type pontoons of wood.

A 10-in. Amsco Type H, belt-driven, heavy-duty dredge pump on the dredge boat excavates the deposit. An idler tension pulley is employed in the 26-ft. center belt drive. The engine is fitted with a hand-wheel control, geared-type, clutch pulley for driving the dredge pump. The engine furnishes power from a pulley, independent of the pump operation, to a head counter shaft which in turn drives the hoist, digging ladder, light generator set, centrifugal water pump, and auxiliary equipment such as typhoon water pump and air compressor.

One of the illustrations shows the forward end of the dredge boat with the driving gear mechanism of the Eagle Swintek digging ladder; the hull suction pipe-line with the hose connection leading from the offset ladder pipe; and the hoist, with its drums for the ladder-line and the swing-lines. The operator's position, at the side of the hoist gives him an unobstructed view of the bank. The dredging ladder is of 10-in. pipe size, 45-ft. length, fitted with Amsco manganese steel heavy-duty traveling chain. The dredge is equipped with electric lights and forward floodlights for night operation.

The offices of the company are at Alexandria, Louisiana. R. C. Baker is president; Ralph Thornton, secretary and treasurer; and O. T. Oden, vice-president and plant superintendent. Engineers of the pump department of the American Manganese Steel Company cooperated with the operators in designing the dredge and selecting equipment.

The shore plant is primarily the work of J. S. Edmunson, who has given much study to the removal of debris from marketable sand and gravel. Modifications in the original designs have been evolved by the local superintendent.

The company can load from 20 to 25 cars of 50 tons each in 9 to 10 hours. The dredge was designed and built as a complete digging tool.

New Rock and Gravel Plant In Santa Maria Valley

A $100,000 corporation, known as the Santa Maria Rock & Gravel Company, has been formed in Santa Maria, California, by E. D. Rubel, Edgar Craig, C. W. G. Murdock of Bicknell, and K. B. Holeman, aided by local capital. The property of the old Santa Maria Water Works Company near Fugler's Point in the eastern end of Santa Maria valley has been leased and construction of a modern plant will begin at once. Broad-gauge tracks, to be laid by the Santa Maria Valley railroad, will give the company access to a sales territory extending from Santa Barbara on the south to King City on the north.

Shore Screening Plant, Rapides Gravel Company

Gypsum in 1928

The gypsum industry in 1928, though very active, was not so productive as in 1927, according to a statement made public by the United States Bureau of Mines, Department of Commerce, based on reports received from 58 operators in 17 States and collected in cooperation with the Geological Surveys of Iowa, Kansas, Michigan, New York, Oklahoma, Texas, and Virginia.

The quantity of gypsum mined in the United States in 1928 was 5,102,250 short tons, a decrease of 244,638 tons, or 5 per cent, compared with 1927. This production, however, has been exceeded only in 1925, 1926 and 1927, and was more than twice as large as that of 1918.

The decrease in production of domestic crude gypsum and in the sales of domestic gypsum was offset to some extent by the increase in the quantity of crude gypsum imported and sold. In 1928, nine importers with plants in nine States, namely, California, Connecticut, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and Washington, reported to the Bureau of Mines that they imported 954,000 short tons of crude gypsum, an increase of 21 per cent compared with 1927. These importers reported 121,339 tons of gypsum sold uncalcined, valued at $449,246, an increase of 13 per cent in quantity, but a decrease of 2 per cent in value compared with 1927. The imported gypsum sold calcined in 1928 amounted to 818,682 tons, valued at $7,921,942, an increase of 40 per cent in quantity and 23 per cent in value, compared with 1927.

Gypsum Mined and Uncalcined and Calcined Gypsum Sold by Producers in the United States in 1928, by States

STATES	Number of active operators	Total quantity mined (Short tons)	SOLD BY PRODUCERS				Total value
			Without calcining		Calcined		
			Short tons	Value	Short tons	Value	
Iowa	7	764,044	154,596	$ 247,263	565,140	$ 5,107,951	$5,355,214
Kansas	3	126,227	33,782	51,427	69,974	884,168	935,595
Michigan	5	677,108	199,036	243,891	460,143	2,915,478	3,159,369
Nevada	5	278,405	52,878	162,404	196,348	1,262,051	1,424,455
New York	11	1,504,826	268,691	636,645	1,068,222	8,976,662	9,613,307
Ohio	3	463,948	12,359	30,211	378,664	3,775,584	3,805,795
Oklahoma	3	397,752	(a)	(a)	(a)	(a)	2,021,635
Texas	4	509,472	34,521	52,989	400,015	3,041,156	3,094,145
Utah	3	28,103	(a)	(a)	(a)	(a)	136,766
Other States (b)	14	402,365	(c)243,549	(c)477,204	(c)502,879	(c)4,171,079	2,489,882
	58	5,102,250	999,412	1,902,034	3,641,385	30,134,129	32,036,163

(a) Included in "Other States."
(b) Includes Arizona, California, Colorado, Montana, New Mexico, South Dakota, Virginia and Wyoming.
(c) This figure includes also sales from Oklahoma and Utah.

The total value of the gypsum sold by producers was $32,036,163, a decrease of $10,138,291, or 24 per cent, compared with 1927. The quantity of gypsum sold by producers without calcining in 1928 was 999,412 short tons, a slight increase—4 per cent—over 1927, and was valued at $1,902,034, or $1.90 per ton, a decrease of 20 per cent in value and of 57 cents per ton; the quantity of calcined gypsum sold by producers was 3,641,385 tons, a decrease of 270,826 tons, or 7 per cent, and was valued at $30,134,129, or $8.28 per ton. This was a decrease of 24 per cent in total value and $1.89 per ton compared with 1927.

New York continues to be the largest producer of gypsum. The production of crude gypsum in that State in 1928 was 1,504,826 tons, a decrease of 10 per cent from that of 1927. This was 29 per cent of the entire quantity mined in the United States and was nearly twice as large as that of the second State, Iowa. New York is also the largest seller of gypsum, marketing 268,691 tons without calcining, or 27 per cent of the United States total, and 1,068,222 tons calcined, or 29 per cent of the total. These figures repre-

New Corporations

Kewaunee Gravel Co., 2711 Vliet St., Milwaukee, Wis., 200 shares n.p.v.; 200 shares pfd., $100 each. To produce sand and gravel and manufacture concrete products. O. O. Kehr, Pres., 1053 40th St.; Glenn Wry, V. P., 396 25th St.; John C. Weber, Sec.-Treas., 2711 Vliet St.; H. F. Gaeth, Dir., 290 3rd St.; Jesse H. Pederson, Dir., 236 24th St.; Fred A. Adler, 386 15th Ave.; all of Milwaukee, Wis.

Western Quarry Co., Des Moines, Iowa, $10,000; 100 shares, $100 each. M. O. Weaver, Pres.-Treas., Iowa Falls, Iowa; John J. Stark, Sec., Des Moines.

Penn-Bangor Slate Co., Easton, Pa. $2200. Harry H. Goodman, Treas., 5752 N. 17th St., Philadelphia, Pa.

Brevoorte Gravel Co., Riverfront, Mt. Carmel, Ill. $50,000. W. R. Kimzey, A. C. Rehnquist, N. L. Eastham, H. W. Seitz.

Mt. Hebron Sand Co., Klamath Falls, Ore. $50,000. Clifford A. Dunn, James M. Baker, Wilson S. Wiley.

Washington Phosphate & Silver Co., Colfax, Wash. $12,000. M. J. Grady, Sec.-Treas.; G. A. Chapman, F. A. Bryant. Will produce phosphate rock.

Cool Spring Bluestone Co., c/o Corp. Trust Co. of America, Wilmington, Del. $25,000.

Kershaw Slag Co., c/o Corp. Trust Co. of America, Wilmington, Del. 1000 shares com. Slag, slate, stone, gravel.

Black Diamond Graphite Corp., Cleveland, O. 3000 shares n.p.v. Earl F. Hartzell, James A. Brady, Harold D. Collart.

Missouri Lime & Mining Co., 1401 Commerce Bldg., Kansas City, Mo. 250 shares authorized. Arlo L. Hunt, Independence, Mo.; Russell W. Hunt, Jefferson City, Mo.; W. E. Bilhorn, St. Louis, Mo. To quarry limestone and manufacture lime.

Lime Products Corp., Max Robbins, Pres., 2302 Bloyd Ave., Indianapolis, Ind. 1000 shares n.p.v. L. D. Buenting. Building plant at Speedway City, Indianapolis P. O., Ind., where equipment is being installed to salvage lime content from sludge.

Glenwood Sand & Gravel Co., Eugene, Ore. $25,000. E. C. Wilfert, M. O. Wilfert, Whitten Swafford.

Dudley Black Quarry Co., R. 1, Dudley, Gleason P. O., Wis. $25,000. To quarry granite. Walter E. Dudley, Richard F. Dudley, both of Gleason; Max Van Hecke, Merrill, Wis.

Agricultural Limestone

In Investigation and Suspension Docket No. 3313, the Interstate Commerce Commission has suspended, from June 15th to January 15th, 1930, Michigan Central Railroad, I. C. C. 5825, Pennsylvania, I. C. C. 97 and several other tariffs of carriers in central territory. The suspended schedules propose to adjust rates and routing from various Ohio and Michigan pits to destinations in Michigan. Hearing before an Examiner of the Interstate Commerce Commission will be held shortly.

Common Occurrences and Characteristics of Commercial Mica

In response to requests from readers we give the following brief technical description of commercial mica, abstracted from a book, written by Henry Mace Payne and distributd by the American Mining Congress, entitled "Undeveloped Mineral Resources of the South." Further valuable information may be found in Bulletin 740, U. S. Geological Survey, "Mica Deposits of the United States."

Occurrence and Properties

Mica occurs usually as muscovite or biotite. The former is potash-bearing, white mica; the latter is the magnesium-iron form, or black mica. Variations of these are lepidolite, a vari-colored lithium-bearing mica; and phlogopite, which is biotite with a minimum of iron. Sericite is mica in massive form, with the appearance of talc. It is hydrous muscovite occurring in schistose rocks. The color of mica is determined by the rock with which it is associated.

One of the properties of true mica is that it can be indefinitely subdivided into thin sheets. When first blocked out, it is split by rubbing the edge against a file to break the laminations loose.

Its specific gravity varies from 2.7 to 3.2; 8 lb. of sheets split per day is a good day's work. Because of its non-absorptivity of water, it is especially valuable as an electrical insulator. Its resistance to rupture by high voltage, called its "di-electric property," also surpasses that of any other known material.

Stocks of mica never accumulate. Once used, it is never salvaged. The phenomenal growth of radio has caused a rapid increase in the demand for mica, so that the total consumption in the United States is four times the domestic production, the deficit being supplied chiefly by Canada, India, Africa, and South America. In 1890 the total production in the United States amounted to only $250,000, while in 1923 the value of this mineral handled in the markets of this country exceeded $2,800,000, or over one-half the world product.

Mica is usually associated with feldspathic rocks, and frequently the pegmatite dykes carry other minerals or gems. In some cases, properties originally opened for mica revert to feldspar or kaolin mines, with mica as a by-product. Not infrequently the mica is quarried or operated by open-cut, in which case it becomes a seasonal operation. Its crystals vary from a fraction of an inch to several feet in diameter, but the usual product rarely exceeds 6 in. across.

These crystals usually have irregular adherences of rock on the edges, which must be cobbed with a hammer before they can be split into 1/16-in. sheets. These are then graded for quality and color, split into the required laminations, and trimmed to standard size or pattern. The trimmings are also utilized. The U. S. Geological Survey estimates that 3 per cent of cut sheet and 8 per cent of cut discs and washers are obtainable from mine-run mica, the balance being waste or scrap.

For use in condensers for wireless, the sheets must be 0.001 of an inch thick, and free from impurities, cracks, holes or wrinkles and must have di-electric strength to withstand a voltage of 20,000. One of these sheets, if of grade 1 quality, can readily be bent into a cylinder ¼-in. in diameter, without showing any cracking.

Any mica to be classed as "sheet" must cut at least 1½ in. by 2 in. and be clean, uniform and free from spots or cracks. Large sheets meeting this requirement command an extra price and a ready market. Trimmings and small sheets are made into built-up mica by pressure, with a shellac binder, and are used in various electrical goods.

Phlogopite is comparatively soft and offers about the same frictional resistance as copper; hence it finds a market as insulation between copper segments in dynamos, motors and elecrical machinery where the edge of the mica lies even with that of the copper, so that both wear down together.

There is no satisfactory substitute for sheet mica in electrical insulation which, in turn, utilizes 86 per cent of the total sheet production. It is obvious, therefore, that the mica resources of the United States offer a strategic commercial value to the prospector.

Much of the mica-bearing area is in agricultural regions, and the operations have been erratically conducted on small capital. The operators have not only lacked engineering knowledge, but have little idea of the rapidly increasing value as the sheets increase in size and have sacrificed profits to avoid intelligent timbering, pumping and handling. Also led by war-time enthusiasm and stimulated by promotion promises of radio development, many properties were sacrificed to stock-selling schemes, and still remain inactive.

Uses of Mica

Two-thirds of the total production of ground mica is required in the manufacture of roofing. High-grade sheet mica is used for electrical purposes, glazing, stove fronts, motor goggles, diving helmets, compass cards, windows in war ships, smelting-furnace sight-holes, optical lanterns, military lanterns, linings for chimneys and canopies, gage fronts, phonograph diaphragms and other sound-producing devices, washers and disks, electric-light sockets, spark plugs, insulators, fuse boxes, guards in rheostats, telephones, lantern slides, radio apparatus, heat screens, submarine detectors, inlaid tiles, painters' placques, and ornaments.

Scale and ground mica are used: with oil as a lubricant; as a coating for tar and other roofing papers to prevent sticking; as a possible source of potash; mixed with shellac and molded into sheets of built-up mica, as a substitute for hard fibre, glass, porcelain, hard rubber, rawhides and various other molded compounds for use in commutators, bushings, brush holders, noiseless gear blanks, wiring conduits, spools for spark coils, and magnet windings, separators, and meter disks. These compounds have various trade names, such as micanite, micarta, balkalite, micamina, and tungash.

Other uses of the finer grades are in raidroad-car axle packings, pipe and boiler covers, fireproof paints, rubber tires, annealing steel, as an absorbent of nitro-glycerine, in calico printing, tinsel decorations, artificial snow, wall-paper decorations, flexible mica cloth and tape. Ground mica gives lustre to wall paper and cloth and to fancy paints, ornamental tiles and concrete. It is an excellent dry lubricant for wooden bearings. Considerable quantities are also consumed as medicine. When coarsely ground and mixed with other ingredients it makes concrete facing material, giving the effect of natural rock.

Statistics of Cement

The ratio of the operations to the capacity of the American portland cement industry during the month of May was 76.4 per cent, according to figures released June 12 by the Bureau of Mines of the Department of Commerce. During the month 16,151,000 barrels were produced, 16,706,000 barrels were shipped and there were in stocks on hand at the end of the month 29,597,000 barrels. Production in May, 1929 was 6.7 per cent less, and shipments 12 per cent less than in May, 1928. Stocks at the mills were 13.9 per cent higher than a year ago.

The Bauxite Industry in 1928

The production of bauxite in the United States in 1928 was 375,426 long tons, valued at $2,273,898, an increase of 17 per cent in quantity and of 14 per cent in total value, as compared with 1927, according to a statement of the United States Bureau of Mines, Department of Commerce.

Bauxite produced in the United States, 1924-1928

Year	Georgia, Alabama,[1] and Tennessee		Arkansas		Total	
	Long tons	Value[2]	Long tons	Value[2]	Long tons	Value[2]
1924	19,940	$156,990	327,630	$1,981,000	347,570	$2,137,990
1925	20,220	109,800	296,320	1,878,450	316,540	1,988,250
1926	20,680	116,650	371,570	2,298,550	392,250	2,415,200
1927	17,110	95,920	303,830	1,892,860	320,940	1,988,780
1928	14,190	80,668	361,236	2,193,230	375,426	2,273,898

[1]No production from Alabama in 1924, 1925, and 1926, and no production from Tennessee in 1927.
[2]Value f.o.b. mines

In Alabama bauxite was produced in 1928 from the Eufaula mine, in Barbour County, and the Davis Hill No. 3 mine, in Henry County. The output was considerably more than in 1927, of which about 68 per cent was shipped for use in the abrasive industry, 26 per cent for use in the chemical industry, and 6 per cent for use in the aluminum industry.

Bauxite was produced in Georgia in 1928 at the Vans Valley and Dupont mines, in Floyd County, the Lane McMichael mine, in Macon County, the Wriley mine, in Wilkinson County, and from a deposit in Sumter County, near Andersonville. The output from Georgia in 1928 was about 46 per cent less than in 1927. Of the output in 1928 about 92 per cent was shipped for use in the chemical industry and the remainder was shipped for use in the aluminum industry.

In Tennessee only one mine—the Montague mine, in Hamilton County, was worked in 1928, from which was produced a small quantity of bauxite that was shipped for use in the chemical industry.

In 1928 bauxite was produced in Arkansas at four mines—the Sweet Home and Hoekstra mines, in Pulaski County, and the Bauxite and Superior mines, in Saline County. The production of bauxite in Arkansas in 1928 was 361,236 long tons, an increase of 19 per cent over 1927. The main production originated in the Saline County field, in which there was a small increase, but the mines in Pulaski County produced important quantities, the increase over 1927 being 148 per cent. The production in Arkansas was shipped mainly for use in the aluminum industry, followed in order by the chemical and abrasive industries.

Bauxite (including bauxite concentrates) exported from the United States, 1924-1928

Year	Long tons	Value
1924	77,065	$3,979,832
1925	78,633	4,134,455
1926	87,770	4,741,260
1927	121,858	7,800,491
1928	112,984	5,210,912

The producers of domestic bauxite reported sales during 1928 at prices ranging from $5 to $7 a long ton. The average for Arkansas bauxite was $6.07 a ton, for Alabama $6.41, for Georgia $5.03, and for the United States $6.06. Probably the values reported to the Bureau of Mines by most operators represent more nearly production costs, as the greater part of the domestic bauxite is produced by consumers of bauxite. The quoted prices* for bauxite were as follows: Domestic: No. 1 chemical ore, 55 to 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 3 per cent Fe_2O_3, $7.50 to $8.50 a long ton f. o. b. Georgia mines; foreign: Dalmatian low-silica bauxite $4.80 to $6.50, Istrian $5.50 to $7, and French red bauxite $6 to $8 a metric ton c. i. f. New York.

Domestic bauxite sold by producers to industries in the United States, 1924-1928, in long tons

Year	Aluminum	Chemical	Abrasive	Cement and refractory	Total
1924	225,780	54,870	66,400	520	347,570
1925	173,040	67,420	73,720	260	314,440
1926	241,850	77,960	72,710	230	392,250
1927	186,490	62,410	71,790	250	320,940
1928	218,398	83,992	72,931	105	375,426

Supply of bauxite in the United States, 1924-1928

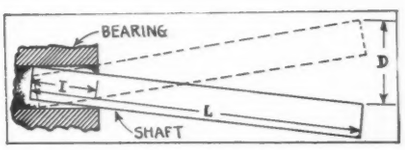
Year	Domestic production		Imports		Total new supply	
	Long tons	Value	Long tons	Value	Long tons	Value
1924	347,570	$2,137,990	201,974	$ 909,493	549,544	$3,047,483
1925	316,540	1,988,250	353,696	1,549,120	670,236	3,537,370
1926	392,250	2,415,200	281,664	1,187,497	673,894	3,602,697
1927	320,940	1,988,780	356,580	1,572,236	677,520	3,561,016
1928	375,426	2,273,898	350,111	1,534,498	725,537	3,808,396

Engineering and Mining Journal, Vols. 125 and 126, 1928.

Measuring Clearance Without A Micrometer

By W. F. Schaphorst

Every user of shafting knows that a loose shaft will "wiggle." The looser the shaft the greater the wiggle. In other words, the looser the shaft the greater the so-called "clearance." However, I dare say that very few users of shafts know that this wiggle characteristic may be utilized for determining the amount of clearance between the shaft and its bearing. And, what is more, it eliminates the necessity of a micrometer or fine hair-breadth measurements.



The sketch herewith shows how it is accomplished and it also shows clearly why it is possible to measure clearance in this way. Take the shaft out of the bearing and measure its length L in inches. Then shove it part way back into the bearing, distance I, which might be called the "distance of insertion." Now move the end of the shaft from extreme to extreme the distance D, as shown in the sketch. It is obvious that the distance D is directly proportional to the clearance. The greater the clearance the greater the distance D. If there is no clearance whatever the end of the shaft cannot be moved. Of course if it is a long shaft it can be deflected owing to the elasticity of the shaft. This matter of deflection must of course be taken into consideration if the shaft is long. If the shaft is short and large in diameter deflection may be neglected.

After making all of the measurements suggested above and shown on the sketch, multiply the movement distance D by the insertion distance I in inches and divide by twice the length of the shaft L in inches. The result will be the clearance in inches. For example: if D = ¼ in., I = 1 in., and L = 10 in., application of the above rule tells us that the clearance between the shaft and bearing is 0.0125 in.

Of course this sketch has been exaggerated purposely to show the principle behind this method of determining clearance. It is obvious that this method is useful also for determining whether or not a bearing is out of round and if so how much. This is accomplished by measuring the distance D in several directions.

NON-METALLIC TRAFFIC PROBLEMS

Conducted by M. S. Allison

Regional Advisory Boards

These Advisory Boards, of which there are thirteen in the United States, are sponsored by the American Railway Association, Car Service Division.

Membership is absolutely without any expense to the shipping public, as all expense is met by the A. R. A.

The object of each Board is briefly outlined as follows:

1. To form a common meeting ground between shippers and receivers and the railroads and carriers as a whole represented by the Car Service Division of the American Railway Association, for a better mutual understanding of local transportation requirements, to analyze transportation needs in its territory, and to assist in anticipating car requirements.
2. To promote car and operating efficiency in connection with maximum loading, and in the proper handling of cars by shippers and railroads.
3. To secure a proper understanding by the railroads of the transportation needs of shippers, and their cooperation in carrying out necessary rules governing car handling and distribution.
4. To study production, markets, distribution and trade channels of the commodities produced in its territory and to acquaint shippers and railroads in each section of the country with seasonal requirements in this section in order to promote intelligent cooperation in the handling of equipment between the different districts of the country.
5. To adjust informally, car and operating difficulties which may arise in its territory between carriers and shippers and receivers.
6. To give the shipping public a direct voice in the activities of the Car Service Division of the American Railway Association in all matters of mutual concern.

Each Board has standing Committees (composed of shipper representatives) for different groups of commodities and meetings are generally held each quarter, when forecasts are made for the coming quarter to enable the carriers to arrange for the required cars, locomotives and service necessary to handle the business.

The combined forecast for the third quarter shows that there will be increased business over the same period of 1928 except in the Northwest and Southeast.

The meetings are attended by railroad representatives as well as shippers, and a great many subjects are discussed and disposed of, so that the accomplishments are of great value to all concerned.

New England Cement Rates

In a decision of the Interstate Commerce Commission, in Docket No. 18112, covering complaint of the Atlas Portland Cement Company, the present rates on portland cement, carloads, from points in the Hudson district of New York, and Lehigh district of Pennsylvania and New Jersey, to destinations in New England, were found unreasonable and a reasonable basis of rates prescribed, to become effective on or before September 16.

The representative rates prescribed from Glens Falls, New York, to destinations in Massachusetts, Connecticut and Rhode Island, on the lines of the N. Y., N. H. & H. R. R., B. & A. R. R., B. & M. R. R. and C. N. E. Ry., and from all producing points in the Lehigh District of Pennsylvania and New Jersey, and from Hudson, Hudson Upper, Alsen and Howes Cave, New York, to all points on the lines of defendants in that portion of Maine and South and West of a line extending from Rockland through Albion, Waterville, Oakland, Farmington and Rumford, are as follows:

	Cents
5 miles	5
50 miles	9½
100 miles	12
125 miles	12½
150 miles	13½
175 miles	14½
200 miles	15
225 miles	16
250 miles	17
275 miles	17½
300 miles	18½

The rates prescribed from all producing points in the Lehigh district and from Hudson, Hudson Upper, Alsen and Howes Cave, to points in Maine *North and East of a line from Rockland, through Albion, Waterville, Oakland, Farmington and Rumford,* are to be as above plus the following differentials to be added, for the hauls of lines operating in Maine in the destination territory, as underlined above.

	Cents
25 miles	2
50 miles	3
100 miles	3½
200 miles	4
300 miles	4½
Over 300 miles	5

Interest on Overcharge Claims

Interstate Commerce Commission Docket No. 20747 covers complaint of Armstrong Cork and Insulation Company, seeking interest on overcharges collected by carriers.

The overcharge was refunded, but the carriers involved declined to pay interest; hence, the complaint.

The Commission found that the Armstrong Cork and Insulating Company was entitled to interest on the amount of overcharge, at the rate of 6 per cent per annum.

Commission Practitioners

The Interstate Commerce Commisson has added to its rules of practice Rule 1-A and 1-B originally effective July 1, but extended to September 1, 1929, under which a bar or register of persons entitled to practice before it will be established.

The Commission has advised that for the present at least a bona fide employee of a firm, corporation or association will be permitted to present its case.

The rule does not, however, permit one to present a case for other than his firm, corporation or association, for which he is a bona fide employee, unless the individual is registered with the I. C. C.

To qualify under this rule of practice it is necessary to secure from the Commission the necessary application blank, which, when filled in and submitted, will be considered by the Commission. If application is approved the applicant will be advised and furnished with an oath to be executed and returned. Following this, the Commission will furnish a certificate of enrollment.

Interstate Commerce Commission, Conference Rulings

The Interstate Commerce Commission's Conference rulings, which were mutually invaluable to carriers and shipper in disposing of traffic problems, were cancelled January 1, 1929.

The Missouri Pacific Lines have prepared their Information Circular No. 21, which contains reference to citations and other sources of information in support of these conference rulings, and is a very interesting and helpful pamphlet.

Crushed Stone

I. C. C. Docket No. 21026 involves rates on crushed stone from Hillsville, Pa., to destinations in New York, Pennsylvania and West Virginia, which were attacked.

A tentative report written by the Examiner proposes a finding that rates are not unreasonable or otherwise unlawful and dismissal of the proceeding.

LEGAL ADVICE TO NON-METALLIC PRODUCERS

Conducted by Leo T. Parker

The Law of Concrete Patents

At present the law relating to concrete patents is well established, particularly because so many of these patents have been thoroughly adjudicated.

However, few persons are familiar with the law on this subject because a great part of the patent information possessed by the average man is "hearsay" and therefore quite unreliable.

Therefore, the purpose of this article is to thoroughly and practically review the leading higher Court decisions which have involved the various phases of infringement, validity of patents, rights of patentees to control the uses of their inventions, fix resale prices, and impose license restrictions on patents directly related to the concrete industry. Moreover, the important points of the Courts' opinions will be cited so that readers will be assured of obtaining reliable information.

Invalid Patents

A United States patent is simply a grant from the Government and is not a guarantee against others infringing the invention. In fact many patents are declared invalid by the Courts, although the same are issued in good faith by the Patent Office.

In other words, a patent merely clothes the patentee with the right to enter a Court and sue an infringer for damages and profits. If his patent is declared invalid it is worthless and valueless to him.

In fact a great number of concrete patents have been declared invalid. This is particularly true where inventors endeavor to obtain a monopoly on simple uses of concrete.

In the case of Morrow v. Oelschlager, 11 F. (2d) 254, an inventor obtained a patent on staggered columns arranged to support staggered reinforced concrete beams. The Court held this patent invalid, saying:

"The staggering of supporting columns is as old as architecture. . . . The present patentee has combined two well-known elements. He has staggered his columns; he has placed over his column head reinforced concrete beams, but the staggered beams simply carry the weight they have always done on columns, whether staggered or regular. Where, then, was invention?"

In still another case MacArthur v. Foundation Company, 230 F. 648, a patent was issued on concrete piles or posts. This inventor simply attempted to prevent all persons from using concrete to make piles. The Court promptly held the patent invalid and explained that if such a patent were valid a multiplicity of patents may be obtained on making various articles from concrete.

Therefore, it is quite apparent that there is a fine line of distinction between patentable and unpatentable inventions.

It may be safely said that no one is entitled to a patent unless (1) he has discovered or invented an art, machine, or manufacture; (2) which art, machine, or manufacture, is new; (3) which is also useful; (4) which is not previously known or patented.

However, a person may obtain a valid patent on a *new process* of making an old article. For example, while making concrete blocks having a cinder base is old and unpatentable, yet a person may obtain a valid patent on a new method of preparing the cinders for mixing with cement. The same is true regarding new methods of making concrete. Yet, such methods must result in either a better or more economical product, otherwise the invention is not useful and, therefore, is not the subject of a valid patent.

Contributory Infringement

Still another common source of legal controversy is where two or more persons endeavor by separate acts to obtain the benefits of patented articles without incurring liabilty for infringement.

The law is well established that the infringement acts of two or more persons or firms may be considered *collectively* by the Courts in determining whether an infringing act has been committed. Also, where contributory infringement is proved to actually exist *all* of the guilty persons are liable for payment of the full profits earned, plus the amount of damages incurred by the patentee.

For illustration, in the very recent case of General Electric Company v. Sutter, 186 F. 637, a most concise explanation of the acts comprising contributory infringement, is stated, as follows:

"The legal principles governing contributory infringement exist where one *knowingly concerts or acts* with another in an unlawful invasion of a patentee's rights. If such assistance is given by furnishing an essential part of an infringing use, such contribution makes him a contributory infringer."

Right of Patentee to Restrict Uses of Invention

Contrary to the opinion of the majority of persons an inventor who sells a patented invention outright may not restrict the uses to which the purchaser puts it. And a license notice attached to a machine or device, which is sold outright, is *not* effective against the purchaser, whether such notices are intended to control the uses to be made of the invention, or the resale price.

For instance, in Bauer v. O'Donnell, 229 U. S. 1, the Supreme Court of the United States, stated the following important law:

"In the essential nature of things, when the patentee, or the person having his rights, sells a machine or instrument whose sole value is in its use, he receives the consideration for its use *and he parts with the right to restrict the use.*"

On the other hand, a patentee may license the use of a patented invention for a limited period on any reasonable terms, *provided he retains title to the device* and does not attempt to compel the licensee to use certain kinds of products in connection with the patented thing. (4 F. (2d) 910).

Asphalt Company Liable For $310,475 Damages In Patent Infringement

The importance of obtaining dependable legal information of the likelihood of infringing a patent is well illustrated by the outcome of the recent case of Barber Asphalt Paving Company v. Standard Asphalt & Rubber Company, 30 F. (2d) 281.

In this case the Standard Asphalt Company filed suit against the Barker Asphalt Paving Company for infringement of two patents, numbers 635,429 and 635,430. It is interesting to observe that $310,475 damages was allowed in view of testimony which showed that the infringer had transacted, during the infringing period, a total gross business amounting to approximately $1,396,781 with expenses of $746,736.

Liability of Quarry Owner For Damages Caused by Heavy Explosions

Generally speaking, the owner of a quarry is liable for any and all damages affecting adjacent property owners as a result of explosions. This is true, irrespective of whether the damage is caused by rock or debris flying through the air, or concussion through the air, or vibrations through the ground.

For example, in Feinberg v. Wisconsin Granite Company, 224 N. W. 184, the owner of adjacent property sued the owner of a quarry for $6,000 damages affecting the foundation, floors, and walls of his building caused from concussion and vibration of high-power explosives used to loosen rock.

The owner of the quarry attempted to avoid liability on the contention that he had expended approximately $200,000 in the business and that the progress of the community should not be halted by imposing liability for consequential damages resulting from the necessary operations of the quarry.

However, it is important to know that the Court held the owner of the quarry liable in damages, saying:

"One lawfully engaged in blasting operations is, according to the weight of authority, liable without regard to the question of whether or not he has been negligent, where by his acts in casting rocks or other debris upon adjoining or neighboring premises or highways he causes direct injury to property or persons thereon. He is also, under the rule more generally adopted, liable for consequential injuries, occasioned by concussion or vibration, to property or persons . . . . . it ought not to be said that it can be lawfully destroyed without compensation in the interest of a mere business enterprise, simply because such enterprise is of great magnitude and general public interest."

Not Necessary for Damaged Property Owners to Prove Negligence

In the case of Beecher v. Dull, 143 A. 498, it was shown that a quarry owner blasted by a process of "mud capping" performed by placing sticks of dynamite on top of the stone, covering it with mud or dirt, and exploding it with a fuse. This operation resulted in considerable vibration and noise and also threw pieces of broken stone on to surrounding property and houses, the owners of which sued to recover damages.

The owner of the quarry attempted to avoid liability on the contention that he had exercised great care in preparing the blasts and that property owners cannot recover unless the damages are negligently effected. Notwithstanding this argument, the Court held the owner of the quarry liable, saying:

"The decided weight of authority supports the view that where one explodes blasts on his own land and thereby throws rock, earth or debris on the premises of his neighbor, he commits a trespass and is answerable for the damage caused, irrespective of whether the blasting is negligently done. This rule is not restricted to liability for injury to the land or improvements of an adjoining owner."

Validity of Zoning Ordinance Prohibiting Excavating of Rock

Since operators of mineral deposits frequently attack the validity of city ordinances which prohibit digging deposits in restricted districts, the recent case of Los Angeles Rock & Gravel Company v. City of Los Angeles, 272 Pac. 1076, presents unusually interesting information.

The facts of this case are that a municipality enacted an ordinance specifying districts in which was prohibited the operation of steam shovels, and other machines for the purpose of excavating rock, sand and gravel.

The Los Angeles Rock & Gravel Company filed suit to prevent enforcement of the ordinance contending that its provisions violated the United States Constitution, and confiscated property without just compensation. The company proved that it had invested a large sum of money previous to enactment of the ordinance and that enforcement of the law would result in great financial loss.

However, the Court held the ordinance valid, saying:

"The authorities to the effect that the use of property in a manner detrimental to the public health or safety may be abated, however valuable the use be to the owner, are too numerous and too uniform to require specific citation. . . . The reasonableness of any legislative act under the police power is presumed when it appears upon its face from common knowledge of its subject-matter to be reasonable. If it does not so appear, any one attacking its validity must plead and prove facts showing that it is unreasonable.....The ordinances forbid the carrying on of operations in residence districts established by a zoning ordinance of the city. . . . . It is not apparent that forbidding the operation of steam shovels or the excavating of deep holes in a residence district is an arbitrary or unreasonable regulation; on the contrary, it would appear that such operations might easily depreciate or destroy the value of such a district for residence purposes and render ineffective the zoning ordinance."

Liability for Violating Law Prohibiting Blacklisting

Since various states have enacted laws prohibiting blacklisting discharged employees, the recent case of Goins v. Sargent, 146 S. E. 131, contains valuable legal information.

In this case a stone company discharged a stonecutter and then informed different firms that if any of them employed the stonecutter in any capacity the stone company would refuse to deliver stone to such person, firm or corporation.

In view of a State law prohibiting blacklisting discharged employees the Court indicated the stone company's liability, saying:

"This notice was given by defendants (stone company).....not to promote the interests of defendants, or of other persons, firms or corporations, but to prevent plaintiff (employee) from obtaining employment in this State. If these facts .....are established then by reason of the statute plaintiff (employee) will be entitled to recover of defendants penal damages."

$2,475 Damages Allowed For Loss of Eye

In Indiana Limestone Company v. Stockton, 163 N. E. 27, it was disclosed that an employee of a limestone company, while engaged in the performance of his regular duties, was struck in the eye by a piece of foreign material which so lacerated the eyeball that its removal was necessary.

The employee sued to recover compensation for the injury. The lower court held the employee entitled to recover $2475, but the employer appealed the case to the higher Court, contending that allowance of this amount of compensation was excessive. However, the Court held the allowance not excessive, saying:

"As a result of the injury the appellee (employee) not only lost the sight of his right eye, but he suffered, as a result thereof, a disfigurement of such a character that his opportunity for future usefulness and earning capacity were thereby impaired. . . . A reading of the evidence impresses us that the Industrial Board, in awarding compensation for the said disfigurement, was very modest."

Bonding Company Liable For Contractor's Debt For Freight Charges

In State v. Aetna Surety Company, 145 A. 172, it was disclosed that a contractor, who agreed to perform construction work, furnished a bond which provided that the latter should "well and truly pay all and every person furnishing material or performing labor, all and every sum or sums of money due him, them or any of them, for all such labor or materials for which the contractor is liable."

During the course of the work, a common carrier delivered to the contractor large quantities of slag.

The contractor failed to pay the transportation and demurrage charges on the slag and suit was filed to collect the same. The bonding company attempted to avoid liability on the contention that transportation charges are not legally included in a bond guaranteeing payment for "material or performed labor." However, it is interesting to observe that the Court held the bonding company liable, saying:

"It does not seem to us that the services rendered to a contractor can be made to depend on the mere circumstance of the place where rendered for its admission into the category of labor performed in the prosecution of the work. They ought rather to depend on the nature of the services and whether they have in a proximate sense contributed to the work's prosecution and completion. . . .That transportation of materials for a contractor in order that he might have them on hand for incorporation in the work is the performing of labor within the meaning of the statute and the bond has been specifically held . . . the labor of transporting materials for a contractor to be used and actually used in the work he has engaged to do, comes within the meaning of the term 'labor'."

Recent Patents

The following patents of interest to readers of PIT AND QUARRY recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,712,495. Stone-quarry skip-car. William E. Farrell, Easton, Pa.

1,712,818. Hydraulic-cement composition and process of producing same. Lennart Forsen, Gerkans, Finland.

1,713,143. Vibrating screen. Gustave A. Overstrom, Pasadena, Calif.

1,713,144. Screen. Gustave A. Overstrom, Pasadena, Calif.

1,713,172. Process for the manufacture of hydraulic cement. Robert De Luce, Los Angeles, Calif.

1,713,222. Mixer for paving materials. Fred E. Greene, Berkeley, Calif.

1,713,297. Centrifugal air-float pulverizer. Otto Olston, Chicago, Ill.

1,713,327. Hammer mill. George W. Borton, New Lisbon, N. J., assignor to Pennsylvania Crusher Co., New York, N. Y.

1,713,355. Hinged cage for grinders. Harry J. Shelton, University City, Mo.

1,713,449. Sand separating and blending means. George F. Royer, Wilkes-Barre, Pa., assignor to Royer Foundry & Machine Co., same place.

1,713,507. Hammer mill. Charles D. Ammon, Lincoln, Neb.

1,713,609. Removable segment for crusher rolls. George E. Krider, Hollidaysburg, Pa., assignor to McLanahan-Stone Machine Co., same place.

1,713,879. Process of aging calcined gypsum. Samuel G. McAnally, Ludwig, Neb.

1,713,957. Pulverizing mill. Samuel Duvall, Chicago, Ill.

1,714,060. Apparatus and process for making cement. John E. Velzy and Walter T. Groner, Dayton, Ohio, assignors to Southwestern Portland Cement Co., same place.

1,714,080. Pulverizing apparatus. Ollison Craig, Worcester, Mass., assignor to Riley Stoker Co., same place.

1,714,120. Drag-line scraper. Harlow Bailey, Jr., San Francisco, Calif.

1,714,259. Drier for sand, gravel, etc. William H. Dance, Cambridge, Mass.

1,714,475. Signal for concrete-mixers. Gebhard Jaeger, Columbus, Ohio, assignor to Jaeger Machine Co., same place.

1,714,515. Indicating the level of pulverulent materials. Kristian Middelboe, Frederiksberg, Denmark, assignor to F. L. Smidth & Co., New York, N. Y.

1,714,580. Dipper-stick end fitting. Emery J. Wilson, Cleveland Heights, Ohio, assignor to Thew Shovel Co., Lorain, Ohio.

1,714,588. Concrete conveying and agitating vessel. James E. Bushnell, North Plainfield, N. J., assignor to Ransome Concrete Machinery Co., Plainfield, N. J.

1,714.601. Loader agitator for concrete-mixing machines. Gebhard Jaeger, Columbus, Ohio, assignor to Jaeger Machine Co., same place.

1,714,602. Drum for concrete-mixing machines. Gebhard Jaeger and Joseph Eggert, Columbus, Ohio, assignors to Jaeger Machine Co., same place.

1,714,830. Sand-cutting machine. Howard L. Wadsworth, Cleveland, Ohio.

1,714,863. Bucket. Waldo A. Hanscom, Longview, Wash.

1,714,957. Hoisting mechanism for charging hoppers. Andrew S. Johnson, Plainfield, N. J., assignor to Ransome Concrete Machinery Co., same place.

1,714,990. Mast hoist. Carl G. Schmid, Indianapolis, Ind., assignor to Insley Mfg. Co., same place.

1,715,123. Apparatus for pulverizing materials. William T. Doyle, Boston, Mass., assignor to Sturtevant Mill Co., same place.

1,715,149. Propulsion means for power shovels and the like. William W. Sloane, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,715,355. Sand-cutting machine. Fred Graf, South Bend, Ind., assignor to American Foundry Equipment Co., New York, N. Y.

1,715,627. Excavator-drive. Charles H. Ruth, Walnut Park, Cal., assignor to Ruth Dredger Mfg. Co., Huntington Park, Cal.

1,715,656. Steering-gear. Arthur G. Hendricks, Wauwatosa, Wis., assignor to Harnischfeger Corporation, Milwaukee, Wis.

1,715,664. Boom-hoist safety means. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place.

1,715,769. Concrete-working apparatus. Edward G. Carr, Chicago, Ill., assignor to Lakewood Engineering Co., Lakewood, Ohio.

1,715,772. Grinding-plate for attrition-mills. William H. Mechlin, Springfield, Ohio, assignor to Bauer Bros. Co., same place.

1,716,025. Emergency stop mechanism for hoists. Carl F. Bledsoe, Chicago, Ill., assignor to Ogle Construction Co., same place.

1,716,170. Loader-truck. Thomas C. Harvey, Columbia, Utah.

1,716,342. Gyratory crusher. John S. Haas and Richard Bernhard, Allentown, Pa., assignors to Traylor Engineering & Mfg. Co., same place.

1,716,432. Excavating-scoop. Robert R. Downie, Beaver Falls Borough, Pa., assignor to Keystone Driller Co.

1,716,572. Process and apparatus for burning lime. Carl J. Wright, West New Brighton, N. Y., assignor to Combustion Utilities Corporation, New York, N. Y.

PIT AND QUARRY FOREIGN DIGEST

Conducted by C. P. Harris, Ph.D.

Sugar and Cement

The setting of portland cement is effected through the separation of crystalline and colloidal structures of different composition from the original materials. The variety, sequence, and quantitative relations of this formation must be of a definite and predetermined character if the setting process is to be normal. Addition of sugar to the gauging water causes extraneous effects to take place. It increases colloidal gel formation at the expense of the crystals. This results in cracks and shrinkages in the cured test piece, and is explainable by the fact that small quantities of sugar are found in the test piece after long intervals. Addition of sodium carbonate to the gauge water, which used alone accelerates setting, in the presence of sugar increases crystal formation with vigorous formation of calcium carbonate.—H. W. Gonell (*Zement*, April 11, 1929).

Clay As a Source of Alumina

Calcined clay briquettes are supplied to a tower 10, Fig. 1, up which passes a stream of hot gases from a furnace 13, accompanied by sulphur oxides (obtained as products of decomposition from the hearth of the furnace) and nitrogen oxides, and down which water is sprayed by a pipe 9. Sulphuric acid is formed and reacts with the clay to form aluminum sulphate. The silica becomes dehydrated. The briquettes are removed from the base of the tower and are lixiviated with water containing sulphuric acid to form a solution of aluminum sulphate which is dried and calcined on the hearth of the furnace 13 to yield a product of the formula $Al_2O_3.SO_3$. The porous mass is ground with sodium chloride and small coal and formed into briquettes which are heated to about 300 deg. C. and treated with steam to yield hydrochloric acid; and are afterwards heated to a red heat in a balling furnace, when sodium sulphate is reduced to sulphide with evolution of carbon dioxide which is led into the furnace 13. The briquettes are treated at a high temperature with steam yielding sodium aluminate and sulphuretted hydrogen which is passed into the furnace 13. The fused mass of sodium aluminate is lixiviated, when magnesium separates as insoluble magnesium aluminate. The solution of sodium aluminate is treated with the scrubbed gases issuing from the top of the tower 10 forming a preciptate of alumina and a solution of sodium carbonate.—N. J. Gareau (British Patent 305,599).

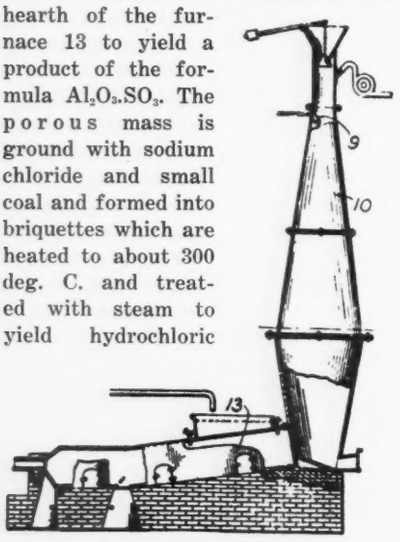


Fig. 1

Kaolins of Ukrainia

Ukrainia possesses 43,151,000 tons residual kaolin deposits and 5,897,300 tons sedimentary kaolin deposits; only 25,312,000 tons of the former and 2,-143,700 tons of the latter have an industrial value. The melting point of the purified Ukrainian sedimentary kaolin is close to normal, namely 1830 deg. The quantity of feldspar admixed is not excessive; quartz is present in quantites less than 1 to 2 per cent; mica is rare; the percentages of SiO_2 and Al_2O_3 are close to normal; Fe oxides are, in the majority of cases, not above 1 per cent; CaO is mostly less than 0.5 per cent; MgO usually fluctuates between a trace and 0.3 per cent; TiO_2 usually fluctuates between 0.36 and 1.5 per cent; Mn oxides and organic substances occur only in exceptional cases and in very small quantity. This composition compares favorably with that of the best foreign kaolins. The process of kaolinization of the Ukrainian crystalline formation took place in two stages: (1) In pre-cambrian times, the kaolinization was started by the pneumatolytic process not far under the surface of the earth; (2) in the pre-devonian period the kaolinization was completed by the process of erosion.—V. I. Luchitzkii. Trans. Instl. Econ. Mineral. Met. (Moscow) 1928, No. 41, p. 3-244. C.A.

Water and the Wet Process

The wet process for the production of portland cement is especially useful in those cases where the raw materials are such that thorough drying and grinding are difficult. The wet slip has the advantages of giving a homogeneous mixture and of being transportable by pumps. The water

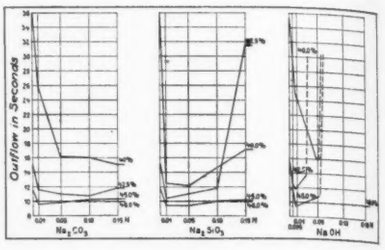


Fig. 2

content of the slip varies between 36 and 50 per cent by weight, depending on the nature of the raw material. The introduction of this amount of water increases the fuel consumption by the necessity of evaporating this moisture, an inherent disadvantage of the wet process. The least possible use of water for wet slip was determined and the condition kept in mind that the mass must remain sufficiently fluid to be pumped. A typical mixture of marl and chalk, containing 76 per cent $CaCO_3$ was used and the "normal" water content assumed to be 48 per cent. With this amount of water 41 per cent of the total heat consumed in the wet process was lost in steam formation. To maintain the viscosity sufficiently low, small additions of substances forming hydroxyl ions were added while the water content was reduced, and the viscosity of the mixtures determined. The curves, Fig. 2, show the effect on the viscosites, "normal" speed of flow being 10 seconds for 48 per cent water. It may be seen that the viscosities of mixtures containing 42 per cent water and 0.05 N Na_2CO_3 and 0.01 N Na_2SiO_3 are very close to the "normal" of 48 per cent water. Excess NaOH increases the viscosity rapidly. The saving of water is about 20 per cent of the clinker weight using Na_2SiO_3 in this very small amount. The fuel saving amounts to over 8 per cent. Furthermore the capacity of the rotary kiln is increased.—Budnikoff, Kukelew and Leschoew (*Zement*, June 13, 1929).

Mixtures of Aluminous Cement and Portland Cement

Setting time and tensile strength of varying mixtures of a portland cement and alumina cement were studied. The mixtures containing 30 to 80 per cent of portland cement set too quickly for ordinary purposes. Twenty per cent of the alumina cements can be replaced by the portland cement without material decrease

in their early strength which small addition of the aluminous cements to portland cement is injurious. Eizo Miki. J. Japan Ceram. Assoc. 35, 622-3 (1927) C. A.

Shaft Kilns

In a continuous shaft kiln for burning limestone and cement, the charge 2, Fig. 3, is heated over the whole height of the kiln to the burning temperature by means of burners 15 supplied with water-gas produced by steam from a waste-heat boiler 9 acting on coke, 6, heated by the radiant heat from the charge, this radiant heat serving also to heat an air supply partly for combustion and partly to pass through the charge and, together with the CO_2 disengaged, to heat the boiler. The water-gas produced, taken off at 17, is delivered by a compressor 14 to the burners 15 and also to burners 11 to supply additional heat to the coke and to the boiler. The air supply is heated in tubes 16 in the walls and handled by a compressor 14. The kiln shaft is annular. Its upper widened end forms a preheating zone and its flared lower end has discharge doors 4. The burners 15 extend into the charge and operate on the surface-combustion principle.—J. Belay (Belgium), British Patent 309,177.

Cement Progress Last Year

The constitution of portland cement is still a subject of controversy, especially between Kühl and Jänecke. The former favors Alite as the active ingredient and the latter Jäneckeit. Fused portland and aluminous cements were prepared by Jamazawa in an electric furnace and their properties compared with very finely ground portland cements. It was definitely established that chemical reagents injure cement either by solution of one of the cement constituents or by combination, and that each such reaction effects a lowering of the strength. Schwarz found that silicic acid forms at least two different hydrates with water, the monohydrate ($SiO_2 . H_2O$) and the semi hydrate ($2\ SiO_2 . H_2O$) being definitely known. Positive determinations demonstrate that the lime content of the raw slip should be 76.11 per cent $CaCO_3$ to obtain the optimum cement properties. Kühl discovered that the best portland cements are made if unusual clayey ingredients are employed. With cements rich in silicic acid, additions of quartz, flint or sand are made to the raw slip, with low silicate cements

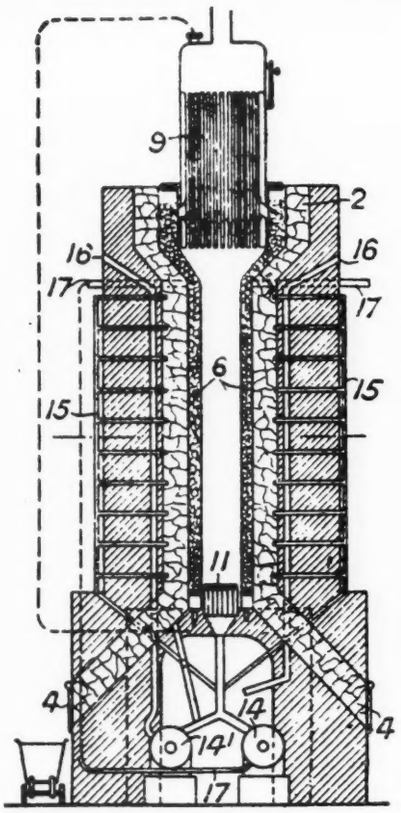


Fig. 3

additions of ground bauxite, iron ore or certain slags are used.

The setting and hardening of cements was explained by Biehl as a crystallizing process first, during setting, with a gel formation during hardening the important factor. A small per cent of $CaCl_2$ was found to raise the temperature of the cement during setting and to make the use of cement in cold water easier. Hardening concrete by steam under pressure was found to result in a strength after two days equal to that attained in four weeks by the usual methods. Five hydrated substances were isolated from cement clinker, namely, calcium hydrate, hydrated calcium aluminate, calcium hydro silicate, calcium sulphoaluminate, and silicic acid gel. It was found that at high temperatures rapid setting occurs especially on the surface and this hard coating prevents rapid loss of moisture from the interior.

The analysis of cement for free lime by means of glycerin and ammonium acetate was improved by the use of tartaric acid for the titration. This permits titration in the cold and phenolphthalein as indicator.

In the field of cement kilns Stehmann claims to have developed his "economic" kiln to a point where a saving of 23 to 26 per cent of fuel is effected. A kiln has been made with a calcination zone and comparatively narrow sintering zone. This causes a slow progress of the slip through the kiln during calcination and is said to improve the heat balance. Naske has described a kiln in which both the firing and the slip move in the same direction, in a continuous current. He figures a 74 per cent utilization of the theory and an 85 per cent recovery of the waste heat of the clinker and waste gases.—C. R. Platzmann (Zement, May 16, 1929).

Improvement in Cement Manufacture

Raw, pulverized slip is granulated by sprinkling with water while in motion, and allowed to fall on a traveling grate. Here it is dried and partially sintered by the waste gases from the rotary kiln, which are drawn through the grate. The material then falls into the rotary kiln which may be much shorter than is usual. The thermal efficiency is much increased. O. Lellep (Germany), British Patent 288,192 B. C. A.

Strength Formula for Cement

Unwin's formula for the strength of cement was investigated. In this formula $y = a + (x-1)^n$, a is the strength after one week, y the strength after x weeks, b a cement constant for various cements. It may be 1, ½, 1/3, etc. The various values for this constant for the different cements are listed. This formula does not apply to high early-strength (rapid-hardening) cements. (*Journal Soc. Chem. Industry* of Japan.)

The Water-Cement Ratio

When pats of neat cement are made with increasing water-cement ratios, and the compressive strength tested at the end, say, of two days, the curve obtained by plotting the strengths as ordinates and the ratios as abscissae is a straight line. The extension of this line intersects the ordinate axis at a point indicating a strength in excess of any obtained with the cement used. If strength tests are made at other intervals and the lines similarly plotted, it is found that this axis intersection point is identical for all intervals. It is shown that the water-cement ratio must lie between 0.3 and 1.0 and in practice is actually between 0.5 and 0.9. The intersection point of the curves appears to be a rough indicator of the quality of the cement.—V. Bährner (*Zement*, April 11, 1929).

INTIMATE NEWS OF MEN AND PLANTS

Kennedy Enters Quarry Business

The resignation of Thomas A. Kennedy, superintendent of construction at North Carolina State College since 1923, was recently announced by President E. C. Brooks, who expressed regret that the institution would no longer have Mr. Kennedy's services.

Mr. Kennedy announced that he would open the Kennedy quarry at Sanford and turn out brownstone from a 14-acre tract on what was known as the Wicker property, which he has purchased. The stone, now being used in the remodeling Holladay Hall, the college administration building, is said by Mr. Kennedy to be the best in this country. It will be used for additions to the First Presbyterian Church in Atlanta, and postoffices at New Bern and Wilmington.

The retiring construction expert supervised the erection of new buildings on the West Raleigh campus, remodeling of others and building of experiment station units and Riddick Field stands. Dr. Brooks stated that Mr. Kennedy's work had been most satisfactory, his skill and interest in his work adding materially to the physical progress of the institution.

Mr. Kennedy is a native of England and formerly held a position with the Norcross Brothers, of Worcester, Massachusetts, and New York City. He has supervised construction work in practically all centers between Maine and Georgia. He believes the re-opening of the Sanford quarry will give the state a live industry and the product will, in his opinion, attract nation-wide attention.

Inland Lime Equipping Plant

Equipment for use on the Inland Lime and Stone Company dock operations is being made ready for shipment by water from the Manistique harbor. A locomotive and dump cars which will be used in hauling stone from the quarry and out on the dock trestle are being loaded on barges ready for the trip to Seul Choix, and a large number of pontoons are lashed together ready to be towed to the harbor sites. The latter, together with sections of heavy pipe, will be used in the work of the "sand-sucker" dredge. The pipes carrying the sand are connected with heavy rubber couplings and the weight carried on the pontoons. A tug from the Coffey Fishing Company fleet will do the towing.

Hancock County Has New Granite Quarry

A new granite quarry, which will specialize on crushed stone for paving purposes, street curbing and building stone, has been opened between Sparta and Culverton, Georgia, by the Cary Granite Company, which is owned by C. S. Cary and F. L. Stewart, the latter for some years manager of the Georgia-Quincy Granite Company of Sparta. This new operation is thought to be the beginning of new developments in the stone business of Hancock County, which has some of the best granite deposits in the country.

Sidebotham Interests Expand

Edward Sidebotham & Sons, Lomita, Calif., has purchased 11 acres of sand and gravel deposits at Los Angeles, Calif., from Hollingsworth Sand & Gravel Co., Lomita, Calif. Operations of the pit by the new owners will begin at once. Faulkner & Sidebotham, San Pedro, Calif., associated with this firm has purchased 2½ acres at Normandie Ave. and Anaheim, Harbor City, Calif. The tract has been obtained to give the company railroad facilities, and following completion of a concrete warehouse and bunkers with capacity of 600 tons. Business headquarters now maintained in San Pedro will be transferred to Harbor City.

English Cement Firms To Merge

Ship Canal Portland Cement Manufacturers, Limited, the largest concern in the Red Triangle group, proposes to merge with other companies in the group, consisting of the Holborough Cement Company, Limited, the Dunstable Portland Cement Company, Limited, and Greaves, Bull and Lakin, Harbury Works, Limited. The merger will be effected by exchange of fully paid common shares of Ship Canal company for shares in the other companies.

Granite Industry Makes Appointments

Two Montpelier men have recently been appointed to positions of trust in the executive department of the Granite Manufacturers Association. This association has become of great importance to Barre and Montpelier, Vermont, in which vicinities the granite industry is the backbone of the community.

T. Tracy Lawson has been appointed secretary and treasurer of the association after 15 months' service as attorney and credit manager. Mr. Lawson was appointed to the position succeeding Paul L. Bailey, recently resigned. Mr. Lawson will still retain his position as attorney and credit manager and devote a large part of his time to this department which he has so ably built up.

He will have, as an assistant, Ernest Massucco of Montpelier. Mr. Massucco is a graduate of Dartmouth college and of the Tuck School of Business Administration and is well qualified for the new position.

Aurora Gravel to Install New Equipment

The Aurora Gravel Company, Aurora, Indiana, contemplates installing additional equipment to increase capacity. The following officers were recently elected: W. B. Ross, president; Henry Ellinghaouse, vice president; Herbert Christy, secretary-treasurer.

Champion Building New Plant

Champion Sand & Gravel Company, M. J. Bacco, general manager, has begun the construction of new plant at Beechwood, Michigan, where railroad grades are being prepared and footings for machinery and building will son be under way. Most of the equipment is to be furnished by Fred T. Kern & Co., manufacturer representative. The plant, to be completed by the end of July, will be electrically operated and will have capacity of 600 tons of washed gravel and sand daily. Company also operates at Champion and Loretto, Michigan, and Pound, Wisconsin.

United Mica Erecting Grinding Plant

The United Mica Corporation, Grant Lowe, vice president and treasurer, of Sylva, North Carolina, has recently taken over Ruben Mica Company, Sylva, and will erect a sheet mica and grinding plant at Dillsboro, North Carolina. Philip Godley is president and Frank Jarrett is secretary.

Cement Firm to Use California Rivers

The bay and river system of California is soon to be used for transporting cement for the first time in the history of cement manufacture in that state. The Port Stockton Cement Company has planned a method of transportation which it believes will revolutionize the industry on the Pacific Coast. The mill will be located on the deep water channel at Stockton. Tank barges will be filled with cement by compressed air and deliver it to silos at strategic points on bay and river fronts. The barges will be equipped to transport fuel oil on the return trips to effect a saving in operation.

Calaveras Gets $850,000 Order

Calaveras Cement Company has been awarded the contract to supply all the cement for the Stockton, California, Flood Control project, on which construction is to start about September 1. The dam is located on the Calaveras river about four miles south of Valley Springs, and but 14 miles from the cement plant, a mile east of San Andreas. Some 400,000 sacks of cement will be required for the dam, which is the nineteenth to be erected on the Pacific Coast by the general contractors, Bent Brothers of Los Angeles.

The cement contract involves approximately $850,000, and deliveries will be made against it for a period of five months, February 1 being the scheduled completion date of the undertaking. The project is a municipal enterprise, the city of Stockton having voted bonds some time ago to impound the flood waters of the Calaveras without interference with the riparian rights of land owners below the dam.

Qualities of Molding Sands As the French See Them

Technical requirements for molding sands are: (1) permeability of gases; (2) refractoriness; (3) freedom from generation of gas; (4) non-adherence to the metal, to which it must give a good surface, and (5) it must not temper nor harden the surface of the metal, says Marcel Guedras in Revue de Fonderie Moderne. These qualities depend upon the characteristics of the sand, the agglomerant, the preparation of the mixture and the drying.

An ideal sand comes from Fontainebleau, Nemours and Rouen, and also from Belgium. The sand from Fontainebleau consists of silica, 98.90 per cent; alumina, 0.20 per cent; lime, 0.12 per cent; magnesia, 0.10 per cent; combined moisture, 0.28 per cent, and oxide of iron, traces.

Grains of sand must be uniform in size, held together with an agglomerant which must be of uniform quality. Although these two requirements are of vital importance, many foundrymen do not appreciate them at their true value, says the author. Crushing of sand frequently destroys its value. Mixing should be dealt with by specialists as should also the construction of mechanical mixers. Each grain of sand leaving the mixer should be inclosed in a skin of agglomerant and this is impossible with a crusher.

The classic agglomerant, linseed oil, is not sufficient and various preparations of molasses, rosin, etc., are added, each foundry usually having its own formula. This problem alone often requires many years of patient research in the laboratory. In Germany agglomerants are prepared by specialized chemists by means of methodical tests which are able to guarantee the uniformity of their product. Foundrymen are thus relieved of a fruitful cause of anxiety, and are assured freedom from blisters and cracks in complicated castings which, in the absence of a satisfactory molding sand, it would have been impossible for them to undertake to make.

Power for Stone Belt

Construction of a 66,000-volt transmission power line between Indianapolis, Martinsville and Bloomington, which will carry greater power supply into the Bloomington, Indiana, stone and industrial district, will be started by the Interstate Public Service Company at a cost of approximately $500,000, according to announcements.

The construction program includes a new substation to be built on four acres of land owned by the company southwest of Bloomington, which will make connections with the 33,000-volt lines coming from Edwardsport and Bedford and from Louisville, Kentucky. At Indianapolis, the new higher voltage line will connect with the Lenore substation of the Indiana Electric Corporation, bringing power from the Dresser power plant.

1928 Feldspar Production

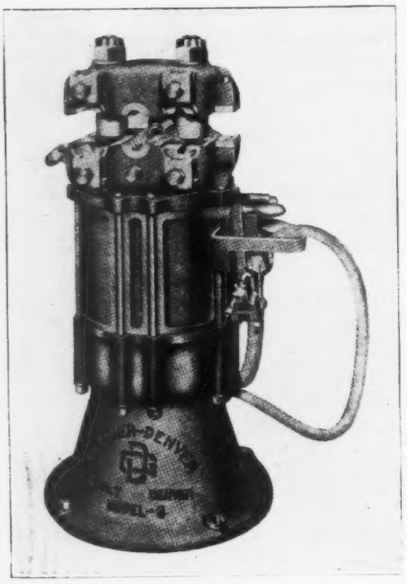
The crude feldspar sold or used by producers in the United States in 1928 amounted to about 210,811 long tons, valued at $1,418,975, or $6.73 a ton, according to reports obtained directly from producers by the U. S. Bureau of Mines, Department of Commerce, in cooperation with the Geological Surveys of Maryland, New York, North Carolina, and Virginia. These figures show an increase of four per cent in quantity, but a slight decrease—.4 of 1 per cent—in total value compared with 1927. Feldspar was mined and sold in 1928 in 12 states—namely, Arizona, California, Colorado, Connecticut, Maine, Maryland, New Hampshire, New York, North Carolina, Pennsylvania, South Dakota, and Virginia. The greatest feldspar-producing region is that which includes the Atlantic seaboard states from Maine to North Carolina. This region reported about 90 per cent of the total production and value in 1928. North Carolina, the leading state, reported about 50 per cent of the total output; New Hampshire, the second state, reported 14 per cent; and Maine, the third state, 12 per cent. The average value per long ton in North Carolina was $5.97; in New Hampshire, $7.79; and in Maine, $8.07.

Except for minor purposes, feldspar is prepared for use by grinding. This work is done principally by commercial mills; only a very small portion is ground by users in their own mills. In 1928 there were 31 commercial mills operated in 12 states—namely, California, Colorado, Connecticut, Illinois, Maine, Maryland, New Hampshire, New Jersey, New York, North Carolina, Ohio, and Tennessee. These mills reported 227,657 short tons of ground feldspar sold in 1928, valued at $3,459,028, or $15.19 a ton, compared with 223,915 tons, valued at $3,564,141, or $15.92 a ton, in 1927, an increase of less than two per cent in quantity but a decrease of three per cent in value. Of the quantity sold in 1928, 202,844 short tons, valued at $2,951,281, or $14.55 a ton, was domestic feldspar, and 24,813 tons, valued at $507,747, or $20.46 a ton, was imported feldspar, including Cornwall stone. Imported feldspar was ground in three states in 1928—New Jersey, New York, and Ohio. These figures represent a decrease in imported feldspar as compared with 1927.

Sand Firms Take Lease

Walter C. Smith Chemical Products, Inc., Brooklyn, New York, and the Pennsylvania Glass Sand Company, Lewistown, Pa., have leased between 300 and 400 acres at Toms River, N. J., from Toms River Poultry Development Company, with privilege to mine sand, gravel, clay, etc., on a royalty basis. They are erecting a plant to cost about $200,000 and to employ 50 men. A dredge will be built and the plant will be electrically driven.

NEWS OF EQUIPMENT MANUFACTURERS



The Sharpener

New Drill Sharpener

One of the latest machines to enter the quarrying and general construction fields is the new model DS-3A double cylinder small drill steel sharpener just placed on the market by the Gardner-Denver Company. Low air consumption and unusual power are said to be the outstanding features of this machine. It is only 44½ in. high and has a base diameter of 24 in. Its weight is 1,500 lb.

This sharpener is equipped with two vertical cylinders which give it extraordinary power and rapid speed of operation. The upper piston is utilized independently in forging operations and the lower piston is brought into play only when clamping. Both cylinders are used in clamping.

This machine will forge bits and shanks and sharpen section drill steel not exceeding 1¼ in. in diameter and not requiring a bit of more than 2½ in. in diameter.

It forms lug shanks on 1, 1⅛ and 1¼-in. round steel and makes collared shanks of 3¼ and 4¼ in. on ⅞ and 1 in. hexagon or quarter-octagon steel.

World's Largest Clamshell Bucket Built by G. H. Williams Company

A 16½-yd. clamshell has just been shipped by the G. H. Williams Company to the Donner Steel Company at Buffalo, which, so far as known, is the largest clamshell bucket ever built. An idea of this bucket's mammoth size will be gained from the illustration showing the world's largest bucket alongside one of the small Williams clamshells, the capacity of which is only ⅜-yd. or 10 cu. ft.

From the bottom of its scoop to the top of the head, the large bucket measures 18 ft. 9 in. in height. When it is lowered open, its scoops have a spread of 19 ft. and cover an area of 133 sq. ft.

This bucket was designed especially to increase the capacity of a crane already in use on the docks of the Donner Steel Company. In the design, it was necessary to conserve every pound of weight possible, to enable the bucket to handle the greatest possible tonnage with the available power. Accordingly, this bucket weighs only 28,000 pounds.

In general design it is of the well-known Williams four-rope type, which gives the operator positive control even on a high bridge crane, where the bucket must be lowered a considerable distance. Smooth, fast operation is always obtainable, the spread of the four lines preventing any twisting or fouling.

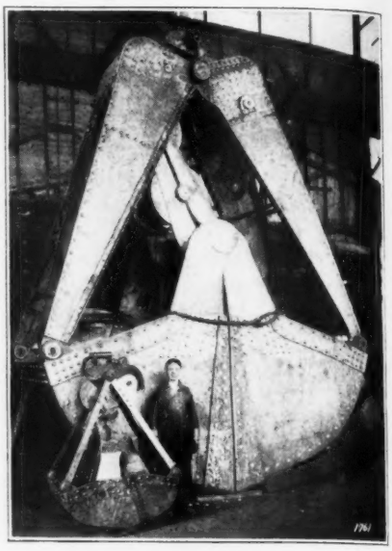
The twin-power-arm design is said to make important savings in cable expense—due to the prevention of cable twisting, and also the entire elimination of side leads of closing cable. The closing line sheaves on each of the twin power arms work always in the one plane, giving a straight line pull. This saves wear on sheaves, flanges and bearings, as well as cable.

Modern Warehouse for Oakland

The illustration shows the new steel reinforced concrete warehouse being erected for the Port Commission of the City of Oakland, California. This new structure affords every modern facility and improvement in warehouse construction. The entire erection was supervised by the Oakland Port Commissioners, the contractors being MacDonald & Kahn, Incorporated.

This structure was constructed of Transit System Mixed Concrete, furnished by the Hutchinson Company of Oakland, California. Nine thousand cubic yards of this specification concrete was utilized.

Constructing the Warehouse



Clamshells Compared

New Volume on Aerial Trams

A volume of 150 pages, bearing the title "Cutting Material Handling Costs," has been issued by the Williamsport Wire Rope Company. Naturally, the reduction of costs refers to the transportation of materials by wire-rope tramways; and, although it might be regarded as plain advertising propaganda, this is not strictly true, for the book contains much information that is published in this country for the first time. It could well be used as a textbook for students. Among the topics discussed are: costs, application, and advantages of aerial ropeways compared with other methods; types of cableways, towers and structures; erection; driving and retarding power; location; and mathematical data.

This book will be sent gratis upon the request of any executive who contemplates an aerial ropeway.

American Hoist Opens Los Angeles Office

The American Hoist & Derrick Company announces the opening of a branch office and warehouse in Los Angeles, California, at 337 South Anderson Street. This latest move is designed to give the users of American equipment in Southern California the best possible service in repairs and new equipment. W. H. Lummus, who has represented the American Hoist & Derrick Company on the West Coast for many years, is in charge of the Los Angeles office.

The New Brush

Robins Squeegee Rubber Brush

Since belt conveyors were first installed, there has been the problem of cleaning the dirt off the return side of the conveyor. Sometimes this material is wet and sticky, and oftentimes very abrasive. This material causes serious wear to return idlers and at the same time causes accumulation on the floor beneath the belt at the several return idlers near the head end of the conveyor. This item in some instances runs into a considerable cost for labor of cleaning up.

The Robins Conveying Belt Company has studied this problem carefully. Recently the company brought out the rubber belt cleaner shown in the illustration. It consists of a series of spiral flutes made of high grade rubber. The roll is 7½ in. outside diameter and made up in sections 6 in. long. The sections are mounted on a wooden core. The rubber brush is to be mounted on the same driving mechanism as now used on Robins brush cleaners.

The rubber cleaner turns with a peripheral speed of about 1,000 ft. per minute. The wearing part is about ¾ in. deep. The spiral shape of the flutes prevents the belt from flopping up and down.

This rubber cleaner is located far enough back of the head pulley so that the belt is straightened out from its crowning over the head pulley.

One of the advantages of this rubber cleaner brush is that it bears very lightly against the belt, thus preserving not only its own life but that of the belt.

In a large gas plant, where this brush was placed in service in January 1928, sweeping wet coke breeze from an open conveyor, there was not enough wear on the flutes after 200 hours' service to measure. The latest inspection of this particular installation was after 9 months' service and it was reported in fine shape and good for many more hours of service.

Beaumont Promotes Moule

L. H. Moule, who has been with the R. H. Beaumont Company for several years, has been appointed sales engineer. Mr. Moule will be located in the Philadelphia office.

Concrete Facts

The Transit Mixers, Incorporated, international distributors and manufacturer of Paris concrete mixers, is distributing an advance booklet on "Concrete Facts." This 16-page booklet, which is thoroughly illustrated, is intended to give a brief outline of the most recent and approved practices relating to concrete, its present and future development. It is especially concerned with providing information covering Paris transit mixers, which are claimed to be the latest development in mixing and transporting concrete. This system provides for accurately mixing the aggregates and cement, mixing aggregates and cement dry, accurately measuring and adding the exact quantity of water, insuring a complete mixture of the whole, providing for delivery of the completed mix exactly when, where and in the quantity wanted and a method of mixing while discharging that delivers the mix in perfect condition for work, either in stiff or wet mix.

Link-Belt Company Issues New Crane Book

The Link-Belt Company has issued a 48-page book, No. 1095, profusely illustrated, describing its complete line of gasoline, diesel, electric and steam operated cranes, shovels and draglines.

This book gives detailed specifications of these machines with capacities from ¾ to 2 yd. Outstanding features and construction details of these machines are described.

Among illustrations are shown crawler cranes handling steel work with hook block; handling sand and gravel with a clam shell bucket; and handling scrap with a magnet. Locomotive cranes are shown unloading sand, and handling other materials.

Crawler shovels are shown in action under severe conditions. Link-Belt machines equipped with dragline, trench hoe and backfiller illustrate the multitude of uses for these machines. This book, which supersedes 995, will be sent gratis, on request.

Geared Locomotives for Service

The Heisler Locomotive Works is distributing Catalog 123. It consists of 24 pages mostly illustrated with cuts of the locomotives in actual work and of the working parts together with considerable haulage data and excerpts of letters from satisfied clients. The catalog enumerates 20 special features which are intended to give more hauling power with a lower expense for upkeep.

Provance Joins Easton

The Easton Car and Construction Company has announced that K. C. Provance, late of The Koppel Industrial Car & Equipment Company, has joined the Easton organization as sales manager.

Multi-Power Clamshell Bucket

The Erie Steel Construction Company has designed a powerful digging bucket that can be adjusted for the kind of material being dug.

This new bucket is named multi-power from its working action, which is a combination of two well-known principles, namely: the multiple rope and lever arm principles. The multiple rope principle gives power, but slows up the action of the bucket. The lever arm principle gives speed as well as power. This new bucket can be rigged up with 2, 3, 4, 5 and 6 parts of line. The scoops are oversize with but very little added bucket weight. Counter-weights in 100-lb. units can be added by one man. They are attached to the bucket by two bolts and can be put on or taken off in but a few minutes.

In addition to these major features, there are others which are important. The stops are improved, relocated and longer, so designed as to add reinforcement to the power arm. The main bearing is wider, and will take the shock of digging more smoothly and eliminate excessive wear. All ropes end in wedge and socket.

Sheaves are of steel and are kept clean by special sheave cleaners. There are heavy down thrust lugs on the bucket scoops to relieve the rivets. The down thrust is on the edge of the bucket, thus forcing the scoops into the material while closing instead of lifting out. Lubrication is by the Alemite system, and a grease gun is furnished with each bucket.

Multi-Powered Clamshell

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$ 21.25	$28.25	$31.75	$35.25	$42.25	$56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	13.65	20.05	27.05	30.65	34.20	41.05	55.05	64.00	88.00

INFORMATION—"Broadcast" space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 3 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

It Pays to Advertise in PIT AND QUARRY

"We received 8 replies to our advertisement—about 7 ***more*** *than we received from another trade paper"—L. Z. Howell.*

Complete Service Publishing Company

538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—3-Roll Bradley Mill.
1—No. 6 Williams Universal Hammer Mill

CRUSHERS

Crushing Rolls

2—8″x5″, 2—24″x12″, 1—24″x14″, 1—30″x12″, 1—30″x16″, 2—36″x16″, 2—42″x16″, 1—54″x24″.

Gyratory

All sizes from No. 2 Reduction to No. 12K.

Jaw

1—2″x6″, 1—6″x3″, 2—8″x10″, 1—6″x15″, 2—9″x15″, 1—11″x22″, 2—12″x24″, 1—18″x36″, 1—24″x36″, 1—60″x84″.

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3′, 4′, 4½′, 5′, 5½′, 6′, 8′ Hardinge Mills and Tube Mills.

DRYERS

One 3′x30′, Three 4′x30′, One 4½′x30′, One 5′x40′, One 5½′x40′, One 6′x60′, One 7′x60′ and One 8′x80′ Direct Heat Rotary Dryers, One 5′x25′, One 6′x30′, Two 8′x80′ Ruggles Coles type "A" and One 5′x30′ indirect heat rotary dryer.

KILNS

3′x15′, 4½′x36′, 6′x60′, 6′x70′, 6′x100′, 6′x120′; 1—4½′ Bruckner Roasting Furnace.

MILLS

Two 33″ and two 42″ Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors, Sand Washers and Classifiers.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Courtlandt 5120

FOR SALE

SPECIALS

3—7′x100′ Bonnot Rotary Kilns
2—8′x60′ Ruggles-Coles D.H. Dryers
2—7′6″x60′ Bonnot ½″ D.H. Dryers
2—6′x100′ Bonnot 9/16″ D.H. Dryers
1—8′x85′ R-C double shell Dryer
1—5′x30′ R-C double shell Dryer
6—5′x22′ Gates iron lined Tube Mills
1—Champion 22″x50″ Jaw Crusher, Overhauled
1—NEW 14″ McCully Gyratory, manganese fitted, can be closed to 2″.
1—6″ McCully Fine Reduction Gyratory Crusher
1—7′x48″ Hardinge Ball Mill, complete, pulverized 200 tons only.
1—No. 43 Marcy Ball Mill, complete
1—No. 515 Allis-Chalmers Ball Mill
6—Tube Mills, silex lined, 5′6″x20′, 5x22, 6x18, 5x12, iron lined—3′x12′.
20—Pebble Mills, 7x10, 7x7, 6x5, 5x4, 4′6x6, 4x5, 3x3′6.
2—Louisville 6′x25′, 6′x30′.
2—5 roll Raymond Mills, High and Low Side
1—No. 1 Williams Vulcanite Hammer Mill
6—Tyler Hummer Screens
2—8′ dia. Raymond Separators, complete
3—Gayco Separators, 30″, 10′, 14′

Jaw, Gyratory, Roll Crushers, all sizes, types.
Rotary, Kilns, Dryers, all sizes, types, not listed above.
Swing Hammer Mills, all sizes, types.
PULVERIZERS—Raymond, Hardinge, Sturtevant, Kent, Griffin, all sizes and types—Ball, Tube and Pebble Mills,—Air Separators.

Request your copy of latest list No. 8

Consolidated Products Co. Inc.,
17-19 Park Row **New York City**
Barclay 0600

Shops and Yards at Newark, N. J. cover six acres.

WE WILL BUY YOUR SURPLUS MACHINERY.

FOR SALE OR RENT

1—Osgood ⅞ yd., crawling tread, Steam Shovel, with or without crane attachments.

STEEL GUY DERRICK
1—10 ton, 70′ mast, 60′ boom, complete with bull wheel, cables, blocks, etc.

AIR COMPRESSOR
1—Ingersoll Rand ERI, size 12x10, cap. 365 ft., short belt idler drive, air receiver, 60 h.p. slip ring motor, 220 volt, A. C.

DRAG SCRAPER HOIST
1—Vulcan Electric, double drum, friction and reversible, Drag Scraper Hoist, direct connected to 25 H.P. slip ring motor, 220 volt, A.C.

PULVERIZER
1—Jeffrey Lime Pulverizer size 3, with Hummer Screen and Elevator.

MAGNET
1—E. C. & M. 54″ dia. Magnet. Used two weeks.

BUCKETS
2—Page ¾ and ½ yd., type C, drag line Buckets.
1—Blaw Knox 2 yd. Dreadnaught, used two weeks on gravel.
1—Owens ¾ yd., ninety percent new.

LOCOMOTIVE
1—45 ton, O-4-O saddle tank, standard gauge, I. C. C. requirements.

JAW CRUSHERS
Sizes 4 x 5 to 42 x 48

GYRATORY CRUSHERS
Sizes No. 2 to 12-K.

A. J. O'NEILL CO.
1524 Chestnut St.
Philadelphia, Pa.

LOCOMOTIVE CRANES

FOR SALE OR RENT

1—15-ton cap. BROWNHOIST, 8-wheel MCB, double drums, 48-ft. 3½-in. boom, ASME boiler just retubed, ¾-yd. Williams Clamshell Bucket.
1—No. 8 BROWNING heavy 20-ton cap., 8-wheel MCB, double drums, 50-ft. boom, ASME boiler, separate swinger. Just overhauled.
1—No. 4 BROWNHOIST 15-20-ton cap., 8-wheel MCB, double drums, 48-ft. 3½-in. boom, brand new ASME boiler. Thoroughly overhauled.

PHILIP T.
KING
"The Crane Man"
50 Church St. **New York**

Slip Ring Motors for Quarry Service

1—200 H. P. 3 ph. 60 cy. 440 V. G.E. type I.M. 450 RPM, 3 bearing belt drive, enclosed slip rings.
1—150 H.P. 3 ph. 60 cy. 440 V. G.E. type I.M. 450 RPM, 2 bearing with enclosed slip rings.
1—150 H.P. 3 ph. 60 cy. 440 V. Crocker-Wheeler type 127-AQ, 440 RPM 2 bearing variable speed control.

MUST BE SOLD AT ONCE

John D. Crawbuck Company
Empire Bldg. :: Pittsburgh, Pa.